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EDITORIAL NOTES.

The Gas Regulation Act.

THE Gas Regulation Bill is now an Act of Parliament. It received the Royal Assent, in company with eighty-six other measures, in the House of Lords last Wednesday by a Commission consisting of the Lord Chancellor, Viscount Chilston, and Lord Gainford. This will be a red-letter day for the gas industry; for the Bill having become the law of the land, the industry is now in a position to take under its provisions the necessary steps to shake-off some of its old obsolete restrictions, and to step on to new ground, where there will be more freedom both in manufacture and trading, which greater freedom will promote development and better service to the community. Operating on the heat-unit basis, our former methods of calculation and appraisement will soon have to be revised. We shall have to reckon capital and working costs not in terms of per 1000 c.ft., but per "therm" (100,000 B.Th.U.); we shall have to speak of gas production as being so many "therms" per ton of coal; we shall have to charge in therms, and analyze costs and profits on the same basis. It will take a little time for members of the staff of a gas undertaking on the issue of an Order by the Board of Trade to get accustomed to this radical change; but when they have mastered it, they will find it just as easy as per 1000 c.ft., though perhaps entailing a little more computation. But the end will justify this. Of immediate and great importance, too, are the financial revision powers which have been conferred upon the Board of Trade, and which will enable them to adjust the terms in existing Special Acts and Provisional Orders so as to conform with the new economic conditions, and to translate the terms from per 1000 c.ft. to therms.

The Act (the text of which is published in later columns) is a good piece of work accomplished; and it has not taken long to pass it through both Houses of Parliament. There was some delay in its introduction; and the gas industry then got somewhat impatient. It was not till May 19 that the President of the Board of Trade (Sir Robert Horne) introduced it to the House of Commons; so that, from introduction to Royal Assent, only eleven weeks have been absorbed. There was excellent ground for hurrying the measure through, in view of the still increasing costs upon the industry, and the imperative necessity that existed—to enable gas undertakings to perform with efficiency and in more favourable circumstances their functions as public utility concerns—to strengthen the conditions that were weak, and to give more room for economical working. We doubt very much whether, in view of the present pressure upon Parliament, the Bill would have now been an Act, had it not been for the sympathetic appreciation at the Board of Trade of the exigent conditions of the industry. Sir Robert Horne has been particularly solicitous that the Bill should become an effective instrument as early as possible; and Mr. Bridgeman, the Parliamentary Secretary to the Board, has won golden opinions from the men of the industry for the manner in which he steered the measure through the House of Commons, the while keeping a sharp eye open upon proposed amendments to ensure that none was made in the measure that would have inflicted an injustice upon the industry, or that would have interfered with the spirit in which the recommendations of the Board of Fuel Research were made and the Bill was framed, or with the judicial powers of the Board in making their decisions under the authorization of the Act. The same conduct of the Bill was witnessed when the Marquess of Londonderry took charge of it in the House of Lords. While making these acknowledgments, the National Gas Council must not be forgotten. But of individual work in connection with the Bill far away foremost stands that of the President of the Council—Mr. Milne Watson. Never has there been greater devotion of self and time to a piece of legislative work for the industry than in this case. There have been many rebuffs and much criticism, particularly during the long weary wait preceding the introduction of the Bill; but perseverance never flagged, and confidence was maintained to the end. The indebtedness, we know well, is great. Two other names also deserve mention. They are those of the immediate past and present Presidents of the Institution of Gas Engineers—Sir Dugald Clerk and Mr. Thomas Goulden. They have often stood at the side of Mr. Milne Watson, and helped him in discussion and in settling knotty problems. This acknowledgment must be put upon record while the industry is parting from an old state, and setting-out to make a larger history under new conditions.

The industry has got its new Act; and through it we look to the future with confidence that gas undertakings will have a larger place in public service than ever before, notwithstanding the heavy weight of new conditions. The Act is an instrument providing opportunities; but what it confers will need to have applied to it the best effort of the men of the industry.

Preparation for the New Order of Things.

THE Board of Trade has now authority to transfer the operations of gas undertakings to the heat-unit basis, and to carry out the financial revision which is overdue by as much as the progress made in the metamorphosis of economic conditions. It must be said that much patience has been shown by the holders of the capital which so rapidly ran a decadent course as soon as the prices of coal and other materials and labour altered the balance of values. The Board has also power to make certain appointments, and to issue Special Orders; and the duty of framing regulations for meter testing, stamping, and certification, together with the examination of meter inspectors, is also concentrated in the Department. A Draft Order in Council, too, transfers from the Ministry of Health to the Board the powers and duties of the former relating to local authority undertakings, the power to sanction the purchase by urban councils of gas companies' undertakings, the power to substitute calorific standards for existing ones, and the power to modify statutory provisions regulating the charges to be made for gas by local authorities. The powers are extensive and of plenary order, and it may be anticipated that time will see an enlargement of them. Much will depend in future upon the prescriptions made in the initial Orders issued by the Board under the authority with which they are now invested.

What next? Applications will have to be made by gas undertakings for Orders—ordinary and special. The former should have priority; but they will not be exercisable instruments until the Gas Referees and Chief Gas Examiner are appointed, and have set to work on their prescriptions. Great importance attaches to these functionaries. The Board will no doubt largely rely upon their expert advice; and the spirit that they infuse into their work will have big effect at the advent of a new state of things in the gas industry. There are supplies of continuously recording calorimeters to be made when the Referees have specified the instrument to be used. When the installation of apparatus is effected, the machinery will not be complete without a competent gas examiner. Every local authority concerned should give early attention to this appointment. There will be no ad-

vantage in neglect. If remissness is shown in this respect, then the appointment will be made by someone else, as empowered by the Act; and the local authority will still have to bear the financial obligation. Shirking the matter will not be the slightest use.

The same applies to statutory undertakings—municipal and company. If the administrators of gas undertakings do not, within two years after the passing of the Act, make application to the Board of their own volition, the Board may give three months' notice to the undertakers of their intention to make an Order which will apply to them. The administrators of gas undertakings before making application to the Board will have to settle in their own minds what shall be the first declared calorific value. Now that the measure has received the Royal Assent, the Board will not welcome an immediate avalanche of applications, nor possibly applications at all till they are ready to deal with them. It will be better for a start to be made by only a few undertakings, in the first instance, applying to the Board, so that the latter may get into proper stride in the matters of principles and of the particulars they will find necessary to enable them to make their decisions. We suggest that in good time—the parliamentary recess commences almost immediately, so we imagine little will be done before the autumn—the Board should issue, either direct or through the National Gas Council, instructions as to procedure, with at the same time an idea as to the information they will require from applicants. The Electricity Commissioners have lately published particulars regarding the nature of the details they need in connection with applications to them in relation to new electricity generating and transmission schemes. For example, it will be requisite for the Board to have a good deal of specific information to enable them to fix standard or maximum prices corresponding to the existing prices per 1000 c.ft., *plus* a reasonable amount to meet the increase due to circumstances beyond control, or which could not have been reasonably avoided by the undertakers, and which have occurred since June 30, 1914, in the costs and charges of, and incidental to, the production and supply of gas by undertakers. These extra charges vary considerably between different undertakings, according to geographical and local and internal circumstances. Applicants may be sure that the details that are supplied to the Board will undergo critical and competent examination, and in this, as in other things, "honesty will be the best policy." It may also be as well to remind gas administrators and officials that the Act specifically prohibits the adoption of the heat-unit basis of charging until an Order has been issued, which Order will define the time and manner in which notice will have to be given of the calorific value of the gas it is intended to supply.

The measure not only creates a new foundation for the gas industry, and paves the way for the dispensing of justice to gas undertakings, but it offers them the opportunities for territorial and industrial gas development. We have pointed this out on previous occasions. Here again gas administrators and their technical advisers should study well their environment, and where there are opportunities prepare to take them. The Board have power to make, in this regard, Special Orders, which will have all the force of Special Acts. The powers that can be embraced in the Special Orders are intended to aid economy, as well as development—by purchasing gas in bulk, by giving separate industrial supplies, by distributing and selling gas in surrounding areas not at present under supply, by purchasing other undertakings, or by amalgamations or joint working. Other powers are permissible; and the Board have authority to grant the necessary capital sanction. All this is highly important, as it is intended that these channels of new development shall be opened-up by securing authority in the most facile way, and at moderate expense. We shall be surprised if there is not a large application for, and utilization of, these Special Orders. The provisions are a clear invitation to make the utmost use of all resources for economizing in, and expanding, the gas business; and it will be up to gas undertakings favourably situated to do all they can to consolidate their position by these means. The cost of capital and materials and labour will probably be in some quarters an inducement to shelve possible schemes, except where the administrators take the open view, and are persuaded that money, materials, and labour are not at all likely to descend to anything like the former levels. Any economies that can be effected through the opportunities specifically accorded, and by making every unit of capital, plant, and materials yield more B.Th.U. for sale, will serve as a partial set-off to the higher capital costs, which in future should be compared on the B.Th.U. basis.

There must likewise be preparation, so that the industry is not caught napping, in respect of the inquiries that are to be held, "as soon as may be after the passing of the Act," into the questions of carbon monoxide and incombustibles in gas. Regarding the former, there is no hurry. This is proved by the twenty years that have passed since the famous Home Office inquiry was held. As to inerts, consumers are protected by only having to pay for the B.Th.U. supplied. The first thing the Board of Trade must, or should, do is to get the gas industry on to its new feet, and make the necessary financial readjustments. There will be plenty to engage attention in this direction for some time to come without saddling itself with extraneous matters which have been forced to the front by obscurants, visionaries, and dealers in the infinitesimal, who by their action and requests deny the facts of experience, and reject them as the basis of argument. The Board of Trade during its career has doubtless met many such; and the Board must weigh very closely what is practicable and necessary with what is impracticable and non-essential—what will aid the greatest progress with what will hamper it. We should never have had railways, motor vehicles, electrical operation, and aeroplanes, if certain risks had been allowed to hinder progress. Gas has spread with remarkable rapidity in its use for cooking and heating, in industry, and among those in the lower grade of social life, to whom (as in the homes of both the upper and middle classes) it has brought comfort, saving of labour, dust, dirt, and smoke, and has promoted healthful conditions. Where, with all this great expansion of use and convenience, is the evidence justifying new trammels, which mean, in a very material sense, uneconomy? And uneconomy is totally against the spirit of the new Act. We hope the Board of Trade, when the time comes, will not be parties to such reactionary movements as have been proposed to them—not by those who are responsible for the well-being of a great public-serving industry, but by other and less interested men.

Who Make Wages Claims—Leaders or Workers?

WHEN the last but one claim was made for an increase of wages for gas workers, and other concessions in regard to overtime, week-end pay, and holidays, it was well known that in many gas-works the men knew nothing whatever about a demand having been made in their name, and so had not been asked whether or not they approved of it. In fact, the matter had begun to be talked of as "critical" and "grave" in those newspapers whose reporters approach union sources for information before many of the workers knew that a claim had been preferred on their behalf, or that there was anything critical or grave about it. There came the settlement under which the leaders of the Unions in the Federation of General Workers covenanted to accept on behalf of their members certain terms, including 6s. per week, and the employers covenanted on the part of the gas industry to pay the 6s. per week, as well as meet other improvements in conditions. There was the strike in the Manchester district and in a few other cases for the 10s., and for the whole of the trimmings in regard to week-end and overtime pay and holidays. There was no strike because the 10s. had not been made into 12s. But despite the covenant there comes this superimposing by the Unions upon the 6s. of a further demand for 6s., or 1s. per shift or day. Who instigated this action? Who is it who has made the move? What is the nature of the mandate that the Unions or the Federation of General Workers have received to make this additional claim? The answer is that they have received no mandate from the workers as a whole. There has been no ballot of the members of the Unions in which a majority have instructed their leaders to make a claim for the additional 6s. So a fair inference is that the moving spirits at headquarters have done this thing entirely of their own motion, other than the leverage exercised from the seats of disaffection.

In this matter of procedure, the leaders of the Unions appear to prefer to put the cart before the horse. They begin to talk about taking a ballot of the men after (not before) they have made the claim for an increase, and when they find the employers—having the right to a point of view of their own, having the right to a voice in saying whether or not the claim is a just one, and having the right to say

whether or not the business and the existing high charge to the consumers (including the prepayment consumers) can economically bear the additional burden—are not prepared to double-up immediately, and comply with the demand. The taking of a ballot at this stage infers the application of a strike in an attempt to enforce the claim. The very men who agreed to the terms of a few weeks ago were throughout the past week talking in this strain as to the employers and the taking of a ballot; and the newspaper reporters were being well primed as to the "seriousness" of the position and of the "unrest" in the industry. These are descriptive terms which are of the stock-in-trade of certain union chiefs when they are anxious to capture public opinion, and try to make the public believe that the cause of any trouble there may be is due not to their excessive demands, but to the hard-hearted individuals who decline to take the irrational course of complying with them without due examination, and of passing the charge on to the consumer. To keep pace with the trade unions, commonsense in industry and business would have to be completely abandoned.

It is certain, too, that the public are tiring of union threats, and of their undeviating habit of unburdening themselves of responsibility, and placing it upon the shoulders of the employers. The public are not fools, and intelligence is not the monopoly of the union mainsprings. Thus it is that the blame that is being put upon the Federation of Gas Employers has not stirred public feeling in the slightest. On the contrary, the charge is treated with contempt. The rebellion against trade union authority in the Lancashire and other areas is too fresh in the public mind, with all the inconvenience that was then occasioned after an honest agreement had been effected, for the public to be stirred by the utter absurdity of the attempt to put upon the employers the blame for the new position. We must confess we cannot understand the mental philosophy of the men who make the charge. Surely after treating with the accredited representatives of the Unions, and making an agreement with them, the Employers' Federation had a right to anticipate that all would be well. They did not ask that a new demand should be made; and it is only partly true that they have refused to meet the leaders in connection with this contemplated outrage of the former covenant. Because up to last Friday the Employers' Federation had not made arrangements for a conference on the new demand, and had made a suggestion that grading and zoning should be dealt with, their action is described as being "provocative." Considering the circumstances, the epithet peculiarly well fits the attitude of those who made demands as their own wills dictate, who claim the right to arrange programme, time-table, and everything else, and who expect the employers to fall prostrate without hesitation or consideration in humble submission. Unless the employers act otherwise than as men of common sense, the position is described as "serious," the "unrest" great, and there must be a ballot of the men. The Union leaders, and they alone, are responsible for the creation of this position; and nothing they can say can divest them of this responsibility. The public well know it. According to the newspapers, a meeting of the Negotiating Committee of the Unions was to be held yesterday; and then—not prior to the claim being made—it was expected that a decision would be come to as to whether or not a ballot of the men should be taken. It is also announced that the Gas Employers' Federation will be meeting to-day.

Are we Drifting Back to Individual Bargaining?

THE trade unions chose the policy of collective bargaining on a national basis; and this naturally led to the formation of representative machinery on the employers' side. Industrial Councils have followed; and the Industrial Court is a development. There are signs that, in the extremist sections of the labour world, the new machinery for settling wages disputes is now losing favour. We have seen it in several industries. Settlements on a national basis often bring about a rupture in the solidarity of the unionist ranks. Want of discipline and obedience to leaders has been witnessed in most of the important industries; and unauthorized strikes have been fairly frequent. This has been due to inability under schemes of collective bargaining to obtain the full pound of flesh for which the unions set out, and upon which agreements have been made by judicial determination. These developments of machinery for settling matters of the kind are the legitimate complement to the organization of the workers. But what has been proved lately by the disaffection there has been over awards is that fully developed organization of the kind does not and cannot, if there is judicial procedure and determination, always bring about a materialization of what the ultraist unionists claim upon theoretical grounds as their deserts. The very object of these later developments in settling disputes is to adjudicate upon the fairness of the claims made, and the wisdom of granting them.

Another thing that the modern developments bring in their train is that claims on a national basis mean—if they are not sufficiently satisfied, and a withdrawal of labour is decided upon—a strike on a national basis, with strike pay on a national basis, which with the men out in mass will result in a more rapid exhaustion of the union funds than was the case in former days. Furthermore, the old rates of strike pay will never give satisfaction for long in these times of increased costs. Therefore, strikes are more likely to come to a speedy end through the empty pockets of the rank-and-file than by any other means. In this condition there is a strong inducement to be again earning money. The unions, there is no doubt, are faced with heavy internal problems, which should not be overlooked when threats are issued with a view to producing compulsory compliance on a national basis with extravagant demands.

It looks very much as though there will be a turn in this particular tide; and that there will be a strong attempt to get back to direct bargaining with employers, without any intervention by independent tribunals. There must, however, be a care that independent tribunals where they exist are not allowed to be sacrificed, if the unions still persist in collective bargaining on a national scale, because such independent tribunals are useful in the event of failure to reach an agreement by direct means. The only terms on which such tribunals should be sacrificed are that national bargaining is totally abandoned, and that industries get back to direct bargaining as between masters and men in each works. This should be the only basis on which a departure should be made from the existing machinery. It must be one thing or the other. The members of forty or more unions in the engineering, foundry, and shipbuilding trades are discontented with the situation created by the refusal of the Industrial Court to grant any further increase of wages in respect of the recent claim for 6d. an hour advance; and at a conference last Friday, a resolution was passed that notice should be given to terminate the four-monthly hearing agreement of February, 1917. But before definite effect is given to this, steps are to be taken to ascertain the views of the members of the unions who, in the first place, took a ballot vote to enter into the agreement. It is hoped by the unions that the result will be that it will be possible then to meet the employers by direct negotiations on the question of wages' adjustments, instead of by the medium of the Industrial Court. Perhaps employers will see good reason for having at hand an independent appeal court in the event of the failure of negotiations conducted with them on a national basis.

Reversible Expansion of Refractory Materials.

STUDIES of fuel and refractory materials are cognate, because fuel-using processes generally—retorting for example—necessitate the economical design and use of furnaces built of refractory materials. On July 28 we published a paper read before the Society of Glass Technology, describing some original work which Mr. H. J. Hodsman, M.Sc., F.I.C., and Prof. John W. Cobb, B.Sc., F.I.C., had been doing on the reversible expansion of refractory materials. At the first blush, without a studious reading of the paper, the importance of the subject to gas engineers may not be apparent to all readers; and it is because of this that (temporary partial relief from current topics permitting) we now briefly call attention to the investigation, inasmuch as it is one that should not be left at the present stage. Mr. A. E. Broadberry, the Chairman of the Refractory Materials Committee of the Institution of Gas Engineers, highly appraises the work, as was clearly shown by his appreciative remarks at the annual meeting in June. If we put the matter in this way, its importance will be apparent: In refractory materials there is when in practical service an expansion and contraction which may be called permanent, is easily measurable, and can be allowed for in all large working structures. Beyond this, however, there is a temporary change of volume (solely dependent on temperature) which

is reversible. Varying physical properties and conditions of refractory materials at different temperatures will cause differences in this temporary expansion and contraction, to which the term "reversible expansion" is applied. Constructors and users of large working plants in which refractory materials are employed will be all the better equipped with definite knowledge as to this reversible movement.

As it is, little is known about the reversible expansion of refractory materials, and data are very scarce. Yet it is quite obvious that in large structures such movement must affect, according to its extent, and with time, the stability of the structure, and its gas or liquid impermeability. To add to knowledge and to supply data are the objects of Mr. Hodsman and Prof. Cobb in taking up this investigation. It is, of course, impossible to trace the reversible expansion in brickwork which has been heated, and which has been cooled-off again, even when evidence of permanent expansion or contraction is plainly to hand. This factor becomes of special importance where the structure is large and composite, as in a range of retorts, and where it determines the necessity for properly placed expansion joints. "Reversible "expansion," too, is the factor in settling how far it is permissible to heat or cool quickly through certain temperature ranges. The modern tendency to use siliceous bricks containing 80 p.ct. of silica for high heats, coupled with the fact that these bricks behave practically the same as silica, makes the range 550° to 600° C. very important as being one in which considerable expansion and contraction have to be faced. The method of investigation adopted by Mr. Hodsman and Prof. Cobb has the great usefulness of determining not only the total expansion or contraction, but the expansion through all the successive temperature ranges, so locating the critical ranges wherever they may be. A somewhat mysterious feature of the results in the paper, which is not easily accounted for, is the contraction just below 600° C. on cooling clay and silica, which actually exceeds the corresponding expansion on heating. Again, pure china clay and ball clay behave differently from ordinary fire-clay in important respects, and indicate the necessity for close investigation of the influence of both chemical composition and physical condition. Silica has its own problems which are receiving attention from investigators, arising from the different forms in which it may occur—forms with different expansion coefficients—and the transformation of one form into another which heat brings about. Processes of treating fire-clay for purifying it chemically may also improve its behaviour in expansion.

The scope of the work is large along the new road upon which Mr. Hodsman and Prof. Cobb have set out; and it is important in contributing to knowledge of the factors that subscribe to the stability and the tightness of such structures as retort-benches. These few notes upon the paper and the work will, we trust, increase interest in both. Not a few of our readers will, we feel sure, join us in the hope that the work will be pursued, and that it will be productive of definite data which will be of practical utility.

Thermal Efficiency Controversy.

An article appears in the current issue from Mr. George Helps, in which he deals with the letter of Sir Dugald Clerk published in our issue of July 14. Mr. Helps once appealed for an open field, and objected to others "butting-in" between the principals in a controversy of this kind. Sir Dugald and Mr. Helps cannot complain that we have at all interfered in this particular personal controversy, which relates to differences of view as to the validity of certain methods adopted in making comparison, and which methods vary the result. Both are welcome to the open field until the one converts the other (if this be at all possible) or fails to do so.

The "Therm."

There was a time when it was proposed that a "British thermal unit" should be designated a "therm." Some people adopted the idea in print; but it was never generally accepted, as "B.Th.U." was regarded as a sufficient abbreviation. Now those who have been calling 1 B.Th.U. a "therm" should stop doing so, as Parliament has statutorily christened 100,000 B.Th.U. a "therm." The idea of doing this saw the light in the Board of Fuel Research report on gas standards; so that probably Sir George Beilby, F.R.S., deserves the credit of being the originator. If any of our friends in other industries dealing on a large scale in B.Th.U.—such as under steam-boilers or in furnaces—or on a small scale as in heating by electricity, want chapter and verse for the legislative installation of the title "therm" for 100,000 B.Th.U., they will find it in the new Gas Regulation Act.

The South Metropolitan Gas Act.

The South Metropolitan Gas Company's Act received the Royal Assent simultaneously with the Gas Regulation Act last Wednesday. The South Suburban Company are proposing now to proceed through the Board of Trade in respect of the heat-unit basis and amendment of the terms of the sliding-scale; so that the South Metropolitan Act is the first privately promoted one to incorporate the Beilby report and financial revision clauses, which introduce (in lieu of the sliding-scale) a new scheme for the future division of profits, including a minimum dividend of 5 p.ct., subject, of course, to the profits realized permitting its payment. We are of opinion that other companies will be inclined to take an opportunity as early as possible of utilizing the South Metropolitan model; but we are not quite sure whether it will be possible to do this through the Board of Trade under the Gas Regulation Act. Perhaps some one can throw light on the point as to whether it will be necessary to promote a Bill to effect a similar change.

Annual Meetings.

There will be no meeting of the South Metropolitan Gas Company this half year. The new Act provides for the annual meeting being held in February or March, or at such times as the Directors may appoint. In a circular issued to the proprietors, the Directors announce that the Bill "has now, in a slightly modified form, passed through Parliament, and at once becomes operative." This being so, the proprietors will no doubt be hoping that the dividend for the current half year on the ordinary stock will be somewhat better than at the rate of 3 p.ct. per annum, which is the distribution to be made, under the Statutory Undertakings (Temporary Increase of Charges) Act, for the past half year; but as to this, and the probable amount, there must be a suspension of definite anticipation, as five weeks of this quarter had passed before the Act became operative; and gas undertakings are not yet out of the wood in regard to higher costs. However, the three Metropolitan Gas Companies are now in line in respect of the holding of annual meetings, and so are some Suburban companies. The movement towards annual meetings is growing among gas companies; and we may expect that this will go on until it becomes the regular practice.

Coke-Oven Gas and Calorific Value.

Only a qualified complaint can be made of the calorific value of the coke-oven gas sent from the Tinsley Park coke plant to the Grimesthorpe works of the Sheffield Gas Company. When the members of the Midland Section of the Coke-Oven Managers' Association were there last Saturday week, the recording calorimeter was showing gas varying between 480 and 550 B.Th.U.; and when there is selling on the B.Th.U. basis, such gas will be of value. Any complaint that can be made is that gas of so variable a quality—good as the minimum quality is—introduces some complexity in regulating its admission to the more regular calorific power gas produced by the ordinary gas-works plant, in order that the mixture sent out from the works shall present as level a line of calorific value as possible. This, however, is a matter that may be brought to a more uniform state when special investigation and experience come to bear upon it.

A Coal Products Experimental Station.

The Midland Coal Products Company are setting-out on a scheme of exploration of the solid materials derived from underground sources. The variety is large; and they are persuaded that, technically and commercially, the values of the different materials have not yet been adequately defined. It is all a question of proper temperature treatment of the raw material, and the correct use of the oils and other products. We admire the confidence of the originators, and have not a word against a piece of enterprise which is being initiated in a manner that commends itself. The Company are inaugurating their existence (whether it will be long or short is a matter dependent upon research results and upon economic movements) through the meritorious channels of experiment and research. Some £100,000 has been subscribed privately by men and companies in the coal-mining and oil and power industries; an experimental station has been

constructed at Kirkby-in-Ashfield, near Nottingham; and our old friend Dr. F. Mollwo Perkin, F.I.C., has undertaken the supervision of the laboratory work. The station has been equipped in a way which would give satisfaction to any experimenter. The Company have not given their adherence to any one form of retort, but have retorts constructed on five distinct principles, with pyrometers fixed in them in different positions. The five types of retorts will enable coal to be treated variously, in order to ascertain the effects upon the same coal. The rest of the plant to the laboratory is in keeping with the character of completeness for critical work. The Company are desirous of testing every class of material from oil shales and lignites to bituminous coals and kindred substances, and of ascertaining how best to treat the products from the various materials. Everything will be tested from the incoming coal to the solid residue from the retorts; and this will be tested for briquetting, in producer plant, and for steam-raising. The oils and ammoniacal liquor will also be treated, and their values appraised. Owing to the high price of pitch, the technical advisers of the Company are going to search round for a new binder to use in the manufacture of briquettes. The whole experiment will be watched with much interest. Any investigation to realize the maximum usefulness and profit from our solid fuels merits approval, providing the work takes a practical route, such as we believe is the case here. This is a different thing from setting-out by inviting the public to subscribe capital on a heavy scale for something still unproved, but made attractive by the most glorious promises.

Tar and Stronger Roads.

It is obvious that there will have to be a radical change in the construction of our roadways. Tar-dressing of roads was originally merely an expedient to abate a nuisance; but it was found to have good preservative effects. Top-dressing is not enough now. The five years' arrears in road reconstruction and repair have brought lessons. With the war a heavier form of traffic came into being; and the motor lorry took a place in industry from which it is not going to be dislodged. On the contrary, its use is largely extending. The employment of commercial motor vans is also increasing everywhere; and the motor charabanc has become quite the favourite mode of travel. All these changes mean a heavier and stronger type of road, which will offer better support, and therefore greater resistance. In this form of construction tar has a large part, for many highway authorities are adopting tar macadam, consisting of blast-furnace slag or limestone coated with tar. An alternative is a sub-crust of material coated with a bituminous mixture with a wearing asphaltic top surface. With these improvements in road construction, in which tar, or pitch, or other binder will be required, top tar-dressing will also be continued, because of its nuisance-preventing and preservative services. On the other hand, stronger roads mean greater expense in connection with pipe work. But wherever possible, proposed extensions of distribution systems should be carried out before road reconstruction commences. Perhaps in new pipe work, the stronger roads will favour along main roads horizontal boring for pipes. [See *ante*, p. 72.]

Railway Costs.

In an article in the "Daily Telegraph" last week, a writer discussed the question of the justification for an increase in railway rates and charges, which, it must be admitted, is inevitable. The railways are being run at a loss of about a million a week. The deficit has already amounted to several millions, and who can wonder at it under such conditions as are described. With higher wages and a largely augmented staff owing to the introduction of the eight-hour day, the railway pay bill has risen from £47,000,000 to £160,000,000 a year. Many essential commodities are more than four times their pre-war costs. For example, certain steel which used to be £9 6s. 8d. per ton is now £38 per ton; and rape oil has advanced from £30 to £133 a ton. Locomotive coal is more than three times its former cost. As against its pre-war figure of 12s. a ton, the price to-day is 36s. 5d. Steel rails, formerly £6 12s. 9d. per ton, now cost £23 per ton; boiler plates have gone up from £8 18s. to £29 10s. per ton; locomotive axles, from £15 5s. to £45 per ton; bar iron, from £8 2s. 6d. to £30 10s. per ton; and hay, required for feeding thousands of horses, has advanced from £4 6s. 4d. to £14 per ton. Probably no single commodity could be mentioned that has not gone up far and away beyond 100 p.ct. of its former cost.

PERSONAL.

The marriage took place, at Streatham Hill Congregational Church, on Wednesday last, of ETHEL, the second daughter of Mr. WALTER T. DUNN, the Secretary of the Institution of Gas Engineers, to JOCELYN ERIC, son of Mr. R. W. NEWMAN, M.Inst.C.E., of Lake Mentz, Cape Province, South Africa.

Mr. ROBERT RITCHIE, the newly appointed Manager of the Thornhill Gas-Works, has been at the Renfrew Gas-Works for the past twelve years.

Mr. P. PICKERING, who was formerly with the Croydon Gas Company, and afterwards with the Wolverhampton Gas Company, has been appointed Distribution Superintendent to the Rochester, Chatham, and Gillingham Gas Company.

OBITUARY.

Mr. ABEL JOHN RAM, K.C., who died last Sunday, in his 78th year, was well known in the Committee Rooms of the Houses of Parliament, and frequently took part in gas and water arbitrations. He was appointed Recorder of Hanley in 1891, and of Wolverhampton some ten years later.

The death has occurred, at the age of 58 years, of Mr. HENRY BLAINE, Assistant Manager to the York Gas Company. Mr. Blaine, who was widely known and respected in York, had been in the service of the Company from his youth, and for the past seven years had been Assistant to Mr. H. E. Bloor, the Engineer, Manager, and Secretary. The funeral took place on the 4th inst., and the respect of the directorate and his fellow workers was shown by the closing of the Company's offices during the morning.

ELECTRICITY SUPPLY MEMORANDA.

ONE thing that is perfectly evident in connection with the construction of power stations under the national reorganization scheme for electricity generation is that there will be strong competition between power companies and big municipalities for the position of being top dogs. This will not make the task of the Electricity Commissioners any the easier; and it may lead to compromises being enforced by the Commissioners, who would, in such circumstances, find the compulsory powers (if conferred) of creating District Electricity Boards and of authorizing generating station purchase of supreme advantage in settling competitive claims. If the compulsory powers are accorded (and it seems now there is a very good chance that they will not be), it will be due more to the necessity for placating matters between rival claimants than because bare electricity necessity demands. And it can be seen to-day that one of the chief incentives to the Government formerly insisting on the Commissioners being given stronger powers than they at present possess was due to circumstances arising out of the electricity industry itself. But where a power company and a municipality are rivals, there is one thing that ought not to be overlooked. It is that the power companies already possess statutory distribution rights throughout large areas, and that they proposed schemes of supply over these extensive districts when municipalities were confining their attentions to the relatively limited and choicest areas. This is a point of precedence, foresight, and enterprise that ought not to be overlooked in adjudicating upon rival schemes, with a power company on one side and a local authority on the other.

Rival Schemes.

A Derby and Notts Illustration.

The very first inquiry that the Commissioners have held has been into rival schemes, promoted on the one part by the Nottingham Corporation, and on the other by the Derbyshire and Nottinghamshire Electricity Power Company. The estimated cost of the Corporation station (which it is proposed shall adjoin the Clifton Colliery, and be on the Trent) is £868,000; and the Company's scheme (also near collieries at Colwick and on the Trent) is estimated to cost about 3½ millions, which outlay would be spread over three years. In deciding between these schemes, the Commissioners have to consider not only the requirements of a large industrial area, but also the question of the co-ordination of electricity supply under the national reconstruction of generating systems. At the inquiry, the claims of both sides were spread luxuriantly before the Commissioners; and the Company urged that they were in the better position to supply all the authorized undertakers in this particular territory (including Nottingham itself) than the Corporation, and that the Corporation station would be a superfluity. As a matter of fact, Mr. J. S. Highfield, who gave expert evidence on behalf of the Company, showed—we think conclusively—that the Corporation were indulging in a huge piece of speculation, with the poor ratepayers as the guarantees, in proposing to build a station with a capacity of 240,000 KW., while the load on their present station is only 12,000 KW. Even if the Corporation are allowed to carry out their scheme, the Company will still have to construct a station on the River Trent. It is perfectly clear that

a Power Company run by private enterprise cannot act as a "middleman" between a corporation and the authorized distributors in an extensive area. Such a circuitous course of putting electrical energy in possession of the consumers would not be in the public interests, and would be opposed to the spirit underlying last year's Electricity Act. So it comes to this, that either the Company's scheme will have to be ratified, or a District Board will have to be formed who would need to take over all the generating stations in the area. That, however, is how the position strikes us as outside observers. An inquiry by Sir John Snell seemed to indicate the probability of a composite arrangement, whereby the Company and the Corporation would join forces, if it could be demonstrated to the Company that this would be the better proposition. But how two such opposing forces as private enterprise and municipal trading can be subject to synthetic treatment, it is difficult to see. One of the points put forward in favour of the Company's scheme was by the Midland Coal Products Company, Limited, who stated that they had selected a site at Colwick adjacent to the proposed generating station, largely because they anticipated being able to dispose of their waste heat and gas to the Power Company. The expert called by the Corporation—Mr. J. H. Rider, who was once associated with Sir John Snell when in private consulting practice—made some destructive criticism of the Company's scheme, and asserted that, in his opinion, coal would cost some 2s. per ton less on the Corporation site than on the Company's. But before this, the Company had made a firm offer to supply the Corporation with electrical energy at £6 per kw., *plus* 0·45d. for coal. This estimate for coal, it was said, would be the maximum, and in practice the Corporation would not be called upon to pay as much, as the price would probably be as low as 0·38d. While we do not envy the Commissioners their judicial work in these matters of determining between private, municipal, and public interests, there will be interest in learning their conclusion in this particular instance. Whichever way it is, there is bound to be a considerable amount of hostile criticism.

Schemes and Required Information.

It is to be no small task preparing, in relation to a new scheme, for an application to the Electricity Commissioners. They do not intend to be content with a modicum of information. They want to know the molecular structure of everything that is put before them—though dealing only with the non-existent and the anticipated. Those who approach the Commissioners are expected to be able to see far into the future—even to a decade ahead, and to make estimates of what will happen then, notwithstanding unknown developments that may make a mess of all forecasts and calculations. The prophecies and estimates relating to five and ten years hence will afford some recreation when those times arrive, and when realities can be contrasted with what is now put before the Commissioners. The Commissioners have issued instructions for the preparation of cases when approaching them with a new scheme for any defined electrical area. Where joint electricity authorities are planned, they want all the administrative details, as it is obvious they are not going to allow any loopholes through which powers can be exercised unless they know precisely what is meant and what is intended, and give their endorsement. In respect of administration, the compilers of the information required are to give particulars from constitution down to the proposed relationships between the authority and the authorized distributors as regards standardization of system, and methods of charging to consumers and authorized distributors. Technical details are to be supplied. In respect of financial matters, capital and revenue estimates are required; and the compilers of the details are to project themselves in fancy well into the yet unborn years. The Commissioners are giving those they will have before them great scope for displaying the nimbleness of their imaginations. They are to prognosticate demand, the electrical potentialities of the district, the probable revenue, and the coal consumption in relation to the kw. hour generated, not overlooking a record of the individual and average coal consumptions of the existing regional undertakings. It will be a vast exercise; and we foresee actual development very largely nullifying prediction based on the insecure ground of individual fancy and selection.

Prodigality in Housing.

The Walsall Corporation are giving an instance of how not to do things in connection with their housing scheme. They are planning to have the houses electrically lighted and the cooking done by gas. Already £3000 has been spent in laying gas mains to the new sites for cooking purposes, and the Gas Department anticipated also the lighting. From these mains the lighting could be done as well as the cooking, without incurring the heavy capital expenditure which the laying of cables with the auxiliary necessaries for electric lighting will involve. The estimated expenditure for this non-essential purpose is £17,000. If before the war interest, depreciation, and renewals, or sinking fund, could have been covered by 10 p.ct., then, as the capital cost would have been half the amount, £850 would have sufficed. But now if 20 p.ct. would be sufficient for these obligations, then (capital charges being what they are) £3400 clear profit will be required. If before the war 15 p.ct. was required to cover the charges, then on the lower capital expenditure £1275 would have been needed; and 30 p.ct. now upon the higher capital outlay would mean £5100. What is the proposal as to income from electric lighting? The intention is to charge a flat-rate of 2d. per lamp per week; and the estimated year's income is £1400. What will be the profit to the Electricity Department on present costs? And where is the money coming from to meet capital charges? A more grotesque piece of Corporation finance has rarely been seen. The most incompetent person in financial matters would have no difficulty in seeing that there must be a loss of thousands of pounds per annum on this proposal. Who is going to pay this loss—the ratepayers, or the other consumers of electricity? Whichever it is, they have a perfect right to protest and to demand that the Corporation should hold their hand from this piece of gross prodigality. Another thing is the charge of 2d. per lamp per week, with unrestricted use. The other consumers of electricity for lighting in the borough would clearly be doing the correct thing to seek to restrain the Corporation from this preferential treatment of the tenants of new houses. We hope they will do so. Meanwhile, it would be interesting to know the wattage of the lamps it is proposed to instal, and the number it is intended to put in each house. This is a good example of extravagance which the ratepayers of to-day cannot afford. Their financial liabilities are quite sufficient without extraneous obligations being placed upon them by extravagant municipal councillors.

Electric Cooking and Heating.

The "Ironmonger" has been speaking plainly regarding the question of electric heating and cooking; and it finds sufficient reasons, though not exhausting them, as to why electric heating and cooking have not made any very substantial progress, during the many years of advocacy. Our contemporary is quite satisfied with the reasons that it has found. What electric heating and cooking there is is only of the occasional order. There is the absence of cheap and reliable apparatus. Though some firms are putting themselves in the position to produce the apparatus in large quantities, they do not appear disposed to go ahead rapidly until the electricity supply authorities take steps to provide a market for the apparatus when ready. The electricity supply authorities cannot provide pockets for householders, nor can they line those pockets. Certainly the fates are against the suppliers in providing one of the main essentials to the use of electricity for heating and cooking—that is, thermal energy at a low price. Such prices as 2d., 3d., and 4d. per 3420 B.Th.U., with apparatus of variable efficiency, is not a condition that the masses of the people can contemplate with enthusiasm, nor can those to whom time is money. Then again electricity undertakings and the makers, obfuscate the fact as they will, have been left in no manner of doubt as to the views of users of these things. The testimonials of a past day as to value and a whole-hearted enjoyment of use are overwhelmed by the testimonials of dissatisfaction. Our contemporary finds that only a small number of electrical men use electricity for heating, cooking, and hot-water supply. They know better. The sweeping assertion is made that "nobody connected with the industry as a supplier of electricity is really satisfied with the apparatus which has hitherto been available." Our contemporary is most observant, and with practical result.

GAS EXAMINATION PRIZE WINNERS.

Awards by the Society of British Gas Industries.

There has been forwarded to us by the Secretary of the Society of British Gas Industries (Mr. Arthur L. Griffith) the following list of winners of the prizes given by the Society in the City and Guilds of London Institute's Final Examinations in "Gas Engineering," "Gas Supply," and "Gas Fitting." The Past Lists will be found on p. 239 of last week's "Journal."

Gas Engineering.

First Prize, Final Examination. £3 3s.
Edwin Charles Nash, 81, Arbuthuot Road, New Cross, S.E.
Second Prize, Final Examination, £2 2s.
Leonard John Weaver, 8, Old Dover Road, Canterbury.

Gas Supply.

First Prize, Final Examination, £3 3s.
David Wm. Evans, 15, Relinque Road, Lower Sydenham, S.E.
Second Prize, Final Examination, £2 2s.
John Wm. Hodgson, 9, Roberts Road, Southampton.

Gas Fitting.

First Prize, Final Examination, £3 3s.
Horace Reginald Stanley, 23, Ferry Park, Cambridge.
Second Prize, Final Examination, £2 2s.
William M'Call, 133, Hainton Avenue, Grimsby.

The Crystal Palace Exhibition.—When reviewing, in the "Journal" for June 15, the Gas Section of the Imperial War Museum and Victory Exhibition at the Crystal Palace, mention was made of the fact that the stand of the South Metropolitan Gas Company (who are occupying the largest amount of space in the section) had not up to that time been completed. It has, however, since then been finished, and is doubtless as much appreciated by visitors as was the case when, with some modifications, it was on view at the Ideal Home Exhibition.

THERMAL EFFICIENCIES OF GAS AND ELECTRICITY.

A REPLY TO SIR DUGALD CLERK.

By GEORGE HELPS.

SIR DUGALD CLERK'S letter in the "JOURNAL" dated July 14 rather mixes up the issues. There is also much in it that is trifling, and to which I need not refer. I took exception, and still do so, to the comparison made by Sir Dugald Clerk of electricity generation and gas production. I based my argument, and still base it, broadly on the fact that he treats two different quantities of coal and compares the result obtained from complete gasification of 100 parts in the one case with the result obtained from the complete gasification of (roundly) 50 parts in the other.

The statement by Sir Dugald Clerk, that all the efficiencies by himself and Professors Smithells and Cobb are based on working results with gas and electricity both on the largest scale, does not affect the foregoing argument, which is one of fundamentals.

Incidentally, it may be mentioned that most gas undertakings obtain in the form of gas about 5,000,000 B.Th.U. from a ton of coal, together with coke, tar, &c., or (say) 20 p.ct. in gaseous form of the heat units of a coal containing 25,000,000 B.Th.U. to the ton. The electricity obtainable by the consumer from the complete gasification of a ton of coal will give out in the best form of electric radiator 8½ p.ct. of the heat units contained in the ton of coal of like B.Th.U. value, less the loss due to distribution. The Gas Light and Coke Company and the South Metropolitan Gas Company are given credit by Sir Dugald for obtaining about 25 p.ct. of the heat of the coal in the form of gas. When comparing this gas making process with the generation of electricity Sir Dugald Clerk gives the thermal efficiency of gas production in this form as something like 45 p.ct., and that of the generation of electricity as 8½ p.ct. This is how the controversy arises.

In the letter now being considered Sir Dugald Clerk endeavours to make his case good. He only succeeds in making it interesting reading. It is a fact that in my patent specification No. 111,495 of 1916, I calculated comparative thermal efficiencies on a basis which was identical with the method of calculation adopted by Clerk, Smithells, and Cobb in 1918; and I note that Sir Dugald claims that the latter method was arrived at independently—"although not then aware of Mr. Helps's publication."

This comparison was made for the purpose of demonstrating the relative efficiencies of "Carbonizing Coal—Coke Making" and "Gasifying Coal—Gas Making;" one being "present gas-works practice," and the other the "practice according to this invention." The comparison was scientific—we have Sir Dugald's benison on that point; and it was trite, because the two like processes could be so compared from the point of view of gas manufacture. I was, and am still, perfectly content with my scientific comparison, as detailed in specification No. 111,495, which sought to prove that, by this method of adjudging relative thermal efficiency, the "present" practice was 56 p.ct. efficient [Sir Dugald's figure is 45 p.ct.], while my invention promises 83 p.ct.

I differ from Sir Dugald when he uses such a method of computation for the purpose of comparing the relative thermal efficiencies of electricity generation and gas making. His letter of July 14 does not change my view, despite his further remarks upon my alleged "fallacious" reasoning. I am afraid we must agree to differ, as perhaps naturally a mind wholly scientific in training cannot be expected to comprehend the real and practical issue involved. I despair of being able to convert Sir Dugald! I am certain that he is so far unable to convert me; but perhaps he does not yet despair. I must leave the practical men of the industry to judge between us; and I do not fear that their verdict will be antagonistic to my views.

The point is briefly this: In the electricity generating process, 100 heat units in raw coal have to be fed to the steam generators to produce about 7·6 heat units for the use of a consumer of electricity. Comparably, says Sir Dugald, 100 heat units are used in the carbonization process for every 45 heat units present in the gas delivered to the consumer, including the allowance for transmission loss [see Clerk, Smithells, and Cobb's report, p. 9, section 13]. Therefore, says Sir Dugald, the thermal efficiency of gas to that of electricity is 45 : 7·6, or 5·9 as great.

I say that this is not the correct method of stating the relative

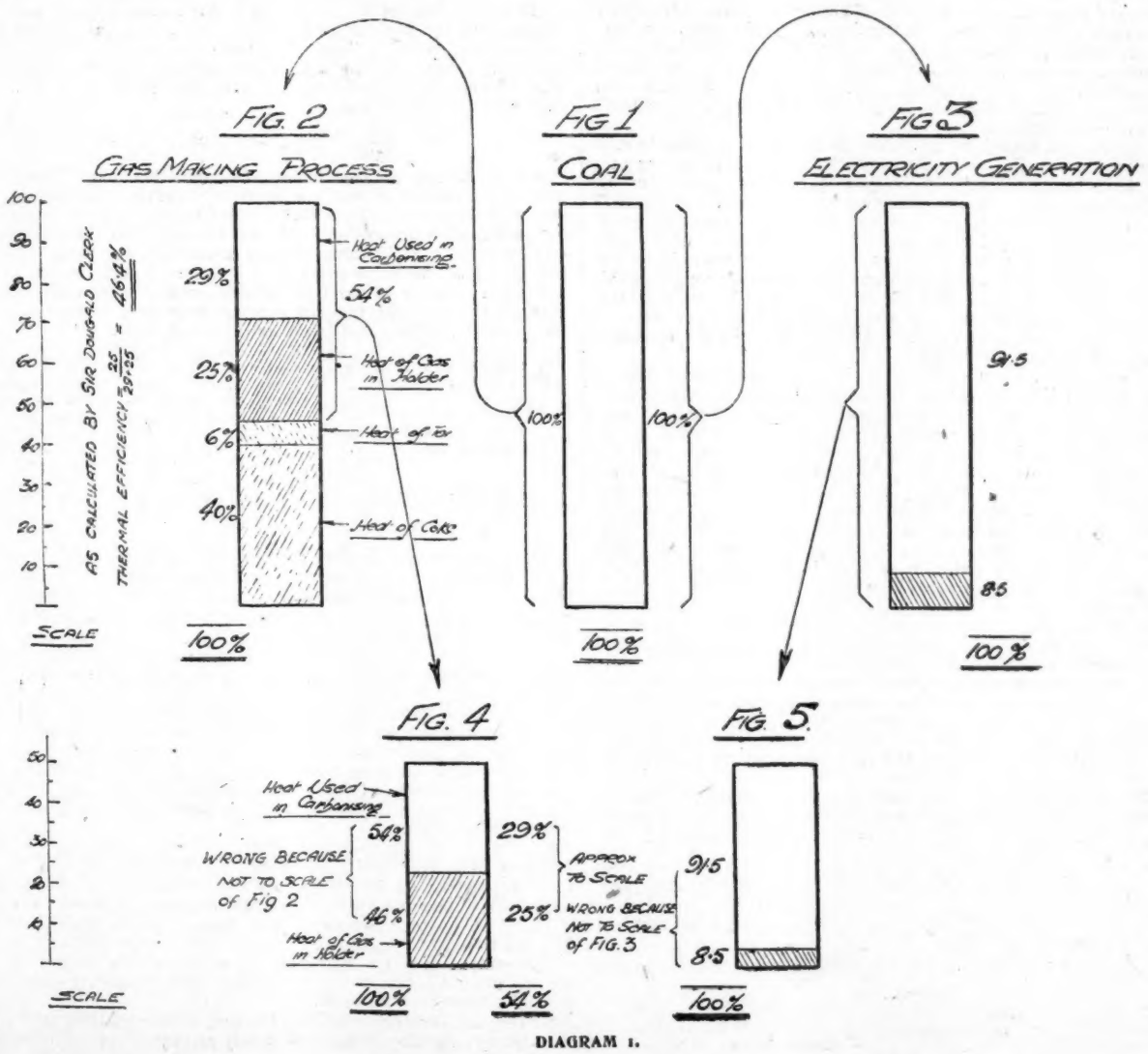

DIAGRAM 1.

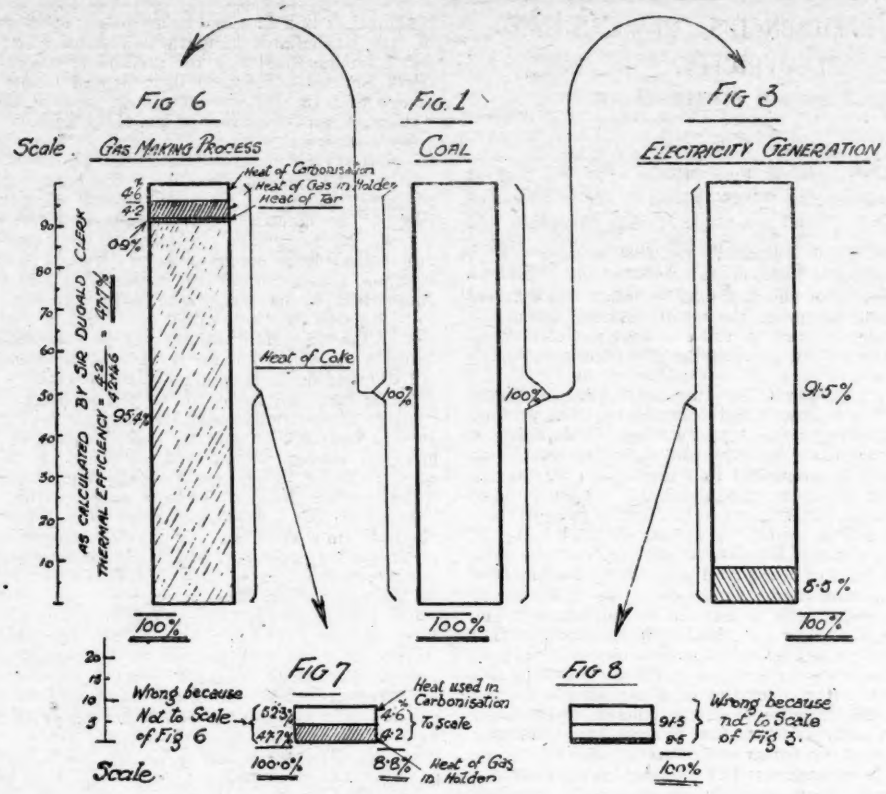

DIAGRAM 2.

thermal efficiences. In the case of electricity, the coal is entirely consumed in the process. In the case of gas, for every 100 heat units in the raw coal only about 27 p.ct. are available in the gas, while about 44 p.ct. are left in the coke and the tar [Clerk, Smithells, and Cobb's report, p. 9, section 4]; and therefore the thermal efficiency of gas to that of electricity is 27 : 7·6, or (say) 3·5 times as great.

Sir Dugald, though he prepared his report with a view to coal conservation, deliberately disregards the utilization of only 27 p.ct. of the original heat units in the gas. He claims 45 p.ct. thermal efficiency for gas as the "efficiency of the carbonization process," on the line of reasoning that if one desires to extract the milk from a cocoanut, and to express the overall efficiency of the process, one must take into scientific account only the weight of the kernel and the weight of the milk, and disregard the weight of the husk, fibre, and shell. But the practical man knows that the true efficiency must take into account all factors, from the raw material to the finished product; and this is where Sir Dugald's scientific reasoning is—shall I say?—fallacious.

The following considerations also have an important bearing on the matter: Equality or any advantage, thermal or commercial, that the present process of gas manufacture has with or over electricity (and it has to be assumed that it has some, or gas would not continue to be sold for purposes that electricity could be used for) depends on the demand for coke, tar, and liquor. If these bye-products were to become drugs on the market (there have been times when they were little better), then to accept a thermal efficiency calculation based upon the erroneous assumption that the heat units in coke and tar are as proportionately utilizable and as commercially valuable as when in the original raw coal, would be more absurd than it is under existing conditions; and the prosaic need of earning dividends would soon lead to the correction of this falsity of values. Let coke and tar be a drug on the market, and with present gas-making processes gas could not compete with electricity in any use.

I take emphatic exception to the thermal efficiency of gas production being compared with the thermal efficiency of electricity generation by the method adopted by Sir Dugald Clerk, because it postulates that heat units in coke and residuals are unaffected by the carbonizing process, and may therefore be assessed at 100 p.ct. of their raw coal value.

The fallacy of Sir Dugald's reasoning is also exemplified by the following: Sir Dugald Clerk's method of calculating the efficiency of gas production (see pp. 7 and 8 of his report) is as below:

Thermal Efficiency of Carbonizing Gas Coal in a Year's Working (1913) of Two Metropolitan Companies.

Gas Light and Coke.

Heat content	Gas sold	24·8 p.ct	26·7 gas produced.
	Gas lost	1·9 ,,	
	Coke sold	38·6 ,,	
	Tar	5·6 ,,	
		70·9	
Heat used and lost in manufacture		29·1	
		100·0	

On p. 8 of the report it is stated: We calculate the thermal efficiency of the process as follows: . . . the gas produced carries 26·7 p.ct. of the heat of the coal, and the heat used and lost is 29·1 p.ct.—making a total heat expenditure of 55·8 p.ct. The efficiency of gas production is thus, 26·7 ÷ 55·8 = 0·478, or expressed as a percentage,

$$\frac{26{\cdot}7}{55{\cdot}8} \times 100 = 47{\cdot}8 \text{ p.ct.}$$

Now in the case Sir Dugald has taken, something like 7·7 cwt. of coke is sold per ton of coal, and to arrive at the thermal efficiency so called, its full value in B.Th.U. is credited to it, which makes the percentage efficiency 47·8. It will be found that the thermal efficiency of a gas-making process calculated on these lines will give just the same percentage whether 2 parts in 100 or any other number of parts be gasified—which is absurd. For example the gas sold and lost represents roundly in each case the percentage of the coal completely gasified, thus:

Heat content.			I.	II.	III.	IV.	V.
	Gas sold and gas lost	.a	26·7	17·3	13·0	4·2	2·0
	Coke sold	.b	38·6	60·2	70·2	90·3	95·4
			7·7 cwt.	12 cwt.	14 cwt.	18 cwt.	19 cwt.
	Tar	.c	5·6	3·7	2·7	0·9	0·4
	Heat used and lost in manufacture	.d	29·1	18·8	14·1	4·6	2·2
			100	100	100	100	100
	Thermal efficiency $= \frac{a}{a+d}$		47·8	47·8	47·8	47·8	47·8

From this table it is seen that in Process V., in which only 2 p.ct. of coal put down for the gas-making process is converted into gas, the thermal efficiency remains the same as in Process I., in which the gas contains 26·7 p.ct. of the heat of the original coal. [See diagrams in Appendix B.] Comment is needless.

Gas is coal, gas is fuel, when it is produced by complete gasification in simple enclosed vessels; but gas as at present made, of high quality, in elaborate and costly bye-product producing plants is only a partial gas-making process, and being incomplete cannot by any stretch of my imagination be usefully compared thermally or otherwise with electricity generation, which is a 100 p.ct. conversion proposition. The only useful comparison is that of a consideration of the results obtained from the use of one ton of coal (or other suitable quantity in each case), as shown in the attached appendix.

Coal is not converted into electricity for the purpose of distributing heat, but mainly for distributing light and power. As I have pointed out before, for an electric horse-power about 2000 B.Th.U. are required. A gas horse-power requires 10,000 B.Th.U. Thus, for power, over three times as many B.Th.U. so to speak have to be expended with gas as with electricity, and so to convert coal into gas and into electricity for the purpose of arguing about a comparison on a B.Th.U. basis is most misleading and scientifically unsound.

Sir Dugald Clerk's calculations, I affirm, violate all the canons of scientific reasoning, because they only pretend to represent the

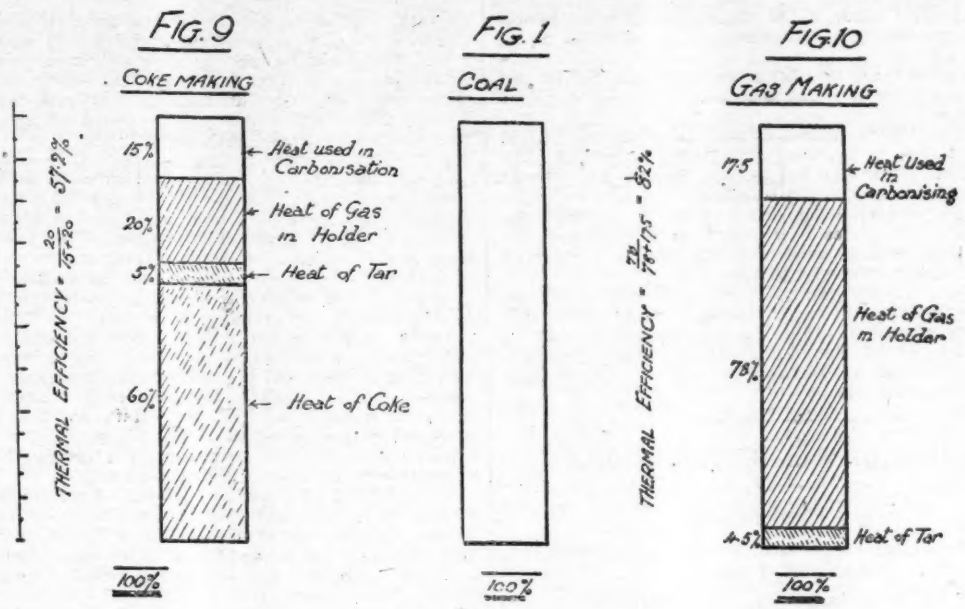

DIAGRAM 3.

truth, and do not represent it. The diagrams, Appendix B, abundantly prove this, in my view. If Sir Dugald were right, we should not see electricity coming more and more into use for all sorts of purposes, as we do see it. The reason for the fact that electricity does make headway is because it offers to the consumer advantages over gas produced by present processes.

A process of town's gas making by complete gasification is likely to become an 80 p.ct. proposition. But the present coke-making process is a 25 p.ct. gas-making proposition; and to call it, or attempt by figure manipulation to make it, a 45 p.ct. proposition is immensely harmful to the whole gas industry.

Sir Dugald is acknowledged to have many and great scientific attainments. If, however, he allows his statements as to comparative thermal efficiencies of gas and electricity to remain as he has stated them, his claims to scientific knowledge on this subject will be entirely wiped-out in the gas industry, so far as the men who know are concerned.

We require the wheels of progress to be accelerated and not held back by Sir Dugald Clerk or by any other "uninformed, energetic and well-meaning" man.

APPENDIX A.

ELECTRICITY GENERATION.

½ ton of coal converted into electricity through a turbine set gives:	1000 units of electricity at the switchboard, with no bye-products.
1000 units of electricity	= 3,450,000 B.Th.U.
1000 units of electricity used through a motor of 90 p.ct. efficiency	= 1202 B.H.P.-hours.
1000 units of electricity reckoned at 4·1 B.Th.U. per candle power hour in a one watt lamp	= 841,000 candle hours.

The above is an example of what can be done on good lines. The average thermal efficiency is given by Sir Dugald Clerk as 7·6 p.ct, for the generation and distribution of electricity.

GAS PRODUCTION, SO CALLED—REALLY COKE-MAKING.

The gas produced from 1 ton of coal in ordinary gas-works practice is 10,000 c.ft. of 500 B.Th.U. (net)	= 5,000,000 B.Th.U.
5,000,000 B.T.U. used in a gas-engine at 10,000 B.Th.U. per B.H.P.	= 500 B.H.P.-hours.

Say, 15,000 B.Th.U. per

KW. $= \frac{5,000,000}{15,000} = 333$ units of electricity.

From this it would appear that 3 tons of coal would have to be carbonized to yield 1000 units of electricity generated by a gas-engine, instead of 1 ton completely burnt in a generator station. This, says Sir Dugald Clerk, shows that gas has the advantage!

5,000,000 B.Th.U. at 25 B.Th.U. per candle power	= 200,000 candle lighting hours in gas.

NOTE.—If coal contains 25,000,000 B.Th.U., 5,000,000 B.Th.U. in the gas gives 20 p.ct. as the thermal efficiency of the gas-making process.

Bye-Products Remaining Over from the Process.

10 cwt. of coke.
10 gallons of tar.
20 gallons ammoniacal liquor.

The thermal efficienoy of gas generation generally, of which the above is an example, is given by Sir Dugald Clerk roundly as 45 p.ct.

APPENDIX B.

THE ARGUMENT BY DIAGRAM.

In Diagram 1, fig. 1 represents the 100 parts of coal that are to be converted into gas and electricity respectively. Fig. 2 represents the result of the process of gas-making, as published by Sir Dugald Clerk. Fig. 3 represents the result of converting 100 parts of coal into electricity. How Sir Dugald Clerk produces fig. 4 from fig. 2 is shown, and also how he produces fig. 5.

It will be seen that Sir Dugald Clerk selects 54 parts out of the 100 parts, which represent the complete result of the gas-making process, fig. 2, and makes them act as if they represented the whole 100 parts by comparing them with the 100 parts of the original coal as shown in fig. 3, reduced in scale in fig. 5. Note well that the scale is deliberately reduced. Fig. 5 should be to the same scale as fig. 3. The whole of fig. 2 may be legitimately compared with fig. 3 to scale of fig. 1. To alter the scale of one figure and compare it with another figure drawn to a different scale, as Sir Dugald Clerk does, upsets the whole comparison.

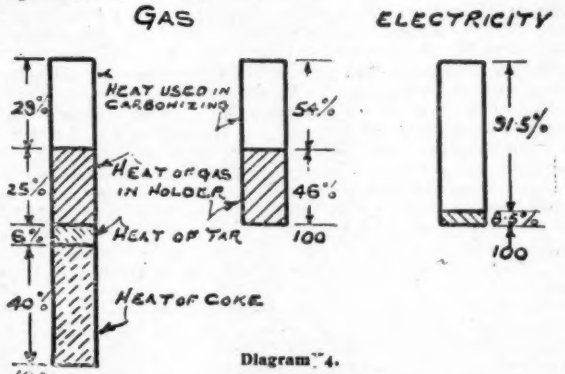

Diagram 4.

I should like to know on what basis of reasoning 54 p.ct. of the results of a process can be made to represent 100 p.ct.

Sir Dugald Clerk argues that 100 parts of coal converted into gas in the ordinary retorting or gas-making process, as compared with 100 parts converted into electricity, is truly represented in the diagram by figs. 4 and 5.

Fig. 2 represents the gas-making process to be compared and not Fig. 4. Fig. 4 obviously could only represent a complete gasification process or part of an incomplete process. Another consideration is this: Fig. 2 shows that 29 p.ct. of the original heat of the coal has been used-up or lost in the production of gas containing 25 p.ct. of the heat of the original coal and in making coke, tar, &c. Fig. 4, as Sir Dugald Clerk argues, represents that 54 p.ct. of the heat of the coal has been used-up in producing 46 p.ct. of the heat of the coal in the form of gas, and ignores the heat lost in the conversion of coal into coke and into tar.

Any process of gas making in which 54 p.ct. of the heat of the coal is lost is a very poor process indeed. Fig. 4 does not represent any process that the gas industry knows of—that I will answer for. The poorest producer-gas practice gives a better result.

The scales in the diagram help to show what the whole reasoning of Sir Dugald Clerk amounts to; and the diagrams illustrate how far he has gone astray.

NOTE.—Figs. 2, 4, and 5 are reproduced from Sir Dugald Clerk's

own diagram; but I have added remarks and figures, as will be seen by comparing them with the small reproduction of his diagram [No. 4].

Diagram 2 shows that the thermal efficiency on Sir Dugald Clerk's plan works-out just the same as in Diagram 1. How ridiculous it looks!

Diagram 3 shows the comparison I made, to which Sir Dugald Clerk refers. I gave the figures of efficiency in my patent specification of 1916 as 56 p.ct. and 83 p.ct. On the diagram, to avoid fractions, they are 57·2 and 82. Sir Dugald Clerk does not seem to see the difference between a comparison of the thermal efficiency of two gas-making processes, each with bye-products, and of a gas-making process with the generation of electricity in which all the coal is burned-up, leaving no bye-products.

I was anxious in this comparison to give to the present process all I could give it, although I could have legitimately argued that as a gas-making process it was only a 20 p.ct. efficiency one. I have already dealt with this point in my previous communication. Diagram 2 cannot be said to represent as a gas-making process 47 p.ct., but 4 p.ct. efficiency.

A MANUAL OF GAS DISTRIBUTION.

By WALTON FORSTALL.

Publishers: United Gas Improvement Contracting Company, of Philadelphia, U.S.A.

[Reviewed by JOHN HENRY BREARLEY, M.Inst.C.E.]

(*Continued from p.* 233.)

PART II. consists of 51 pages—in two sections, (1) Mains, (2) Services—devoted to the "Design of the Outside System." The materials used are freely discoursed upon. The author considers that cast iron for mains has proved so satisfactory that the engineer who decides to instal, on a large scale, wrought iron (words which a foot-note says stand also for steel), instead of cast-iron, incurs great responsibility. He supports this by citing greater length of life for cast iron, weakness of service connections when tapped in wrought-iron or steel pipes, and so on. These arguments have all had pretty fair play since the "boost" in steel and wrought-iron mains began; and a few more years will probably settle such controversies for good. Meanwhile, the cautious engineer will make haste slowly in changing-over from cast-iron, which has served and is serving so well. On the form of joint to be adopted it is worth noting that in America the only joint that has found acceptance for cast-iron work is the ball-and-socket joint, formerly made-up exclusively with cast lead, but now more and more (in small sizes) with cement, and in large sizes with lead wool. The author seems to favour the cement joint, which he says can make the leakage of a cast-iron system of slight consequence. Notwithstanding his preference for cast iron for ordinary work, he admits there is no doubt as to the advisability of risking the life of wrought iron or steel for high-pressure work.

We learn that standard patterns for cast-iron pipe and specials are making great headway in America. Inspection at the point of manufacture is also recommended, for which purpose "pipe inspectors" have come into vogue. The author says: "It will pay any company laying over (say) five miles of mains a year, to make the attempt to have its pipes and specials inspected by such a man." Years of foundry inspection show that rejection varies from 2 p.ct. in the best to 60 p.ct. or more at the worst foundries. We are not given any details as to the tests and general line of inspection which have determined this rejection; but presumably they are based on failure to comply with the American Gas Institute standard.

The "Mains" section contains some extremely useful notes on specials kept for stock; interesting suggestions on estimating the consumption in an entirely new "lay-out;" notes on mains to be laid in streets prior to the need for gas; location details—*i.e.*, foot-path *v.* roadway, one *v.* two mains in a street; distance in or out from curb; depth; temperature considerations; and types and inspection of valves.

In Section 2 [Services], wrought-iron *v.* steel is discussed. In America, as here, the development of the steel industry has resulted in less and less wrought-iron pipe being available for use. The difficulty of distinguishing between wrought iron and steel has rendered the substitution of the latter for the former comparatively easy; and the practice has been very common. The author seems to adopt a neutral attitude as to the relative merits as they exist to-day; but most of us have our convictions that the change in practice has not been for the better. For services, preservative coating is strongly recommended; and the Hickenlooper mixture, together with the manner of its use, is described. The cost is comparatively low. In good soil, coated gas-services "may be expected to last certainly from twenty to thirty years, and perhaps much longer." The indecision of this quotation stands-out in a book which is generally characterized by lucidity and definiteness. It would be better to say the length of life is unknown, and have done with it. However, it is worth noting that the records in Philadelphia are so arranged that the age of every service laid since 1897 is known; and some valuable information hereon will be possessed after thirty or forty years. Mr. Forstall finishes up his dissertation on service materials by stating considerations which point to the gradual universal use of galvanized pipes. Sizes of services for fuel, lighting, and engines are dealt with. Stop-cocks and service-drips also come in for attention. After discussing the pros and cons of curb-cocks, he decides that the resulting advantages are not enough to justify the extra cost—a decision with which most engineers here will agree, and which coincides with general British practice.

Part III. is devoted to "Equipment." It is divided into two sections: (1) main and service work, (2) inside work—the whole comprising some 112 pages. The purpose of separating in this way the description of various tools used is designed to save interruption of the thread of narration later on. It has its advantages in this regard; but when reading the narrative of actual operations it is necessary to turn back for an indefinite number of pages to refer to the corresponding illustrations of tools used. Nevertheless, it will probably be preferred in its present form, though it can be imagined that the author had many a quiet soliloquy before determining his choice. The ideal method would have been to have had the equipment descriptions in a supplementary volume. Indeed, this book is so comprehensive that some advantages would have accrued if it had been split-up into a number of smaller volumes. But this would have defeated the evident object of the author in his aim to traverse the whole subject within the compass of a single volume.

The details of "Equipment" are full. They are supplemented by some 70 figures, embracing tools, which run into the hundreds. No more need be said here than that a British practitioner will find the exercise of comparing with his own practice anything but a dull exercise. Kits of working tools for various purposes are fully enumerated. It is a phase that has come into prominence here during recent years; and the book under review affords the key to American practice, as determined by Mr. Forstall.

Part IV. deals with main work, and is divided into two sections: (1) Installation, and (2) maintenance—the whole comprising 13 chapters extending to 137 pages. Under "Organization," the formation of working gangs is considered; and the author has the perspicuity to state that the composition will depend largely upon local conditions. A typical gang employed in the "growing fringe" of Philadelphia is made up as follows: One gang foreman, two caulkers, two caulkers' helpers, and fourteen labourers. Constancy in size of a gang is urged as the key to maximum results. The detail of preliminary work and removing paving is thoroughly described, even to the manner in which pipes should be dropped off the truck to a paved roadway. A further example of the excellence of the detail work may be quoted in the equipment prescribed for laying large mains, the schedule of which runs to sixty items. Four pages are devoted to trenching, and working instructions therefor. To a Briton it seems like a voice from the past to read: "In each gang it is advisable to have one or two men better paid than the rest, and expected to serve as pacemakers . . . This pitting of each man against his fellows conduces to high efficiency." Such an arrangement here would have to be a most secretive covenant, or the cat would be among the pigeons!

The chapter on "Laying Mains" extends to 48 pages; and one cannot refrain from saying that, with the instructions given and a short practical experience, it would be possible for an absolute novice to lick himself into a commendable craftsman. Descriptive matter has never more nearly approached the utility of practical demonstration than is evidenced in these pages. One is inclined to quote examples, but space forbids. In regard to the cutting of pipes, if the book is a criterion, our American friends seem to retain the old method of using a dog chisel and sledge or striking hammer. At all events, three-wheel or chain pipe-cutters are not mentioned, whereas considerable detail is devoted to the cruder method, even to the exhortation that the eyes of the workmen should be protected by goggles. The work of jointing is well traversed, and specially interesting parts of this chapter are the notes on maintaining a supply during main-laying, "purging" a main—*i.e.*, filling it with gas—and temperature precautions.

A chapter of ten pages is devoted to refilling and repaving a trench; and a schedule of equipment for the purpose is given. A chapter of 23 pages is devoted to recording; and this contains a considerable amount of information which, so far as the writer is aware, has not hitherto appeared in any British work on the subject. In Philadelphia, street clerks are employed to collect details for the draftsmen in the office who keep up to date the plans of district mains; and it will give some idea of the way detail is gone into when it is stated that the equipment with which each clerk is provided is given—extending to twenty-three items. Measuring-up is described, including measuring at other than right angles. Several forms in relation to the work of recording are given. There is a short chapter on bridge mains.

In the section on maintenance, leak work occupies a chapter of twenty pages, and pressures a chapter of eight pages. The author is unable to discuss electrolysis from the standpoint of personal experience; and he dismisses the subject in a few lines, devoted to reasons why Philadelphia has had a negligible amount of current carried by the gas structures.

Part V. is devoted to service work; and, similarly to mains, it is divided into sections: (1) Installation, (2) Maintenance. As the line of treatment follows that for mains, this part may be dismissed with the comment that, generally speaking, it is up to the same standard in thoroughness.

Part VI. is a short treatise of six pages on street lighting services. Nothing is said about the types of lights in use, their

spacing, or any other conditions affecting street illumination, as the author properly remarks that these belong to the sphere of gas utilization and not its distribution. In later portions of the book, however, there is so much matter that has to do with gas utilization that the omission in the one instance does not seem to synchronize exactly with the commission in the other. In any case, the division between utilization and distribution is a very thin one; and in many phases the one is linked with the other, as the book abundantly testifies. Be that as it may, the volume is dangerously near being overloaded as it is; and there is no part of it that one would willingly give up for a dissertation on street lighting unless he was actually a superintendent in the particular department.

Part VII. is devoted to meter work. It is divided into three sections: (1) Meters, (2) installation and maintenance, and (3) forms and records—the whole extending to 167 pages. For lucidity of illustration and plenitude of practical hints and description, there is no publication known to the reviewer that compares with it. The historical survey reminds one that it is just a century ago (1820) that the first dry meter was invented by John Malam, but that we have to take a jump to 1844 for the Croll and Richards design, which founded the principle of the two-diaphragm double slide-valve meter, which is the essential principle of dry meters as used to-day. America, until 1864, depended chiefly upon meters imported from England. Then a prohibitive import duty of 40 p.ct. was imposed; and this resulted in a great development of home production. The first prepayment meter was made in England in 1889; but it was five years later that the first prepayment meter was made in America—in New York City. It is rather surprising to learn that although used extensively in America to-day, a few of the larger companies have given them up after a more or less extended trial. In contrast with this, one large city is quoted where 60 p.ct. of all the meters are of the prepayment type. It is not clear what the author has in mind when he says, "As this type is not adapted to a sliding-scale of prices, and such a scale will form the future gas-vending standard, prudence counsels conservatism in the purchase of prepayment meters for any situation." In this country there has been no conflict between the incidence of the sliding-scale and the prepayment meter; legislation providing in Special Acts for the permissible differential rate of charge when gas is vended through slot mechanism. We are now passing through a further stage in having to meet a rate of charge by "therm;" but no one anticipates there will be any more difficulty in this regard than there is from charging by volume, as at present.

Mr. Forstall has some extremely interesting observations to make on the nomenclature and capacity of dry meters. Referring to the five-light meter, he says that in its early stages it was designed to pass 30 c.ft. of gas per hour, and from time to time this has been increased to 140 c.ft. (or more) per hour; so that the term "light" affords no clear indication of the capacity of the meter. Marked differences have also arisen from the fact that the capacity has been increased by some makers and not by others; and the situation with regard to meters in stock is complicated by meters from the same maker—but of different years' make—not being of like capacity. This variation in some cases amounts to 100 p.ct. He follows this up by a suggested standard, based on a uniform capacity under a given differential pressure and size of case. This standard has been in use in Philadelphia for more than ten years, and has proved satisfactory. It cuts out half the sizes in the old-time schedule, with the result of a reduction in idle stock and in maintenance costs. The "Life of Gas-Meters Committee" of the Institution of Gas Engineers, in conjunction with a Committee of the Society of British Gas Industries, have agreed a new standard of dry meter sizes, which it is proposed to put into operation on Jan. 1, 1922; and it is reasonable to assume that, in considering the subject, they have drawn information from American experience. Anyway, those who have taken an active part in arriving at the new standard will find Mr. Forstall's remarks upon the subject well worth perusing.

(To be continued.)

Oil-Shale for Gas-Making.—Abstracting an article from the "Mitteilungen des Reichsbundesdeutscher Technik," the "Technical Review" says there is a big oil-shale region in Württemberg. The ash is about 80 p.ct., leaving 20 p.ct. or more organic substances. A number of small gas-works in Germany utilized oil-shale during the war for gas making. It is claimed that some 15 cubic metres of gas having a calorific power of 4000 calories can be obtained from 100 kg. of shale when continuously treated. Large-scale experiments carried out at the Stuttgart Gas-Works have shown that the generation of gas from shale in ordinary gas-producers is only economical in certain cases. From 100 kg. of dry shale, something less than 9½ cubic metres of 4269 calories gas was obtained. Some 19·4 kg. of coke was necessary as fuel for each 100 kg. of shale treated in the retorts. The value of shale gas can only be compared favourably with water gas on the assumption that shale with a fairly high calorific power is used. In certain small works gas making from shale may with advantage be considered in the region of the highly bituminous shales of Württemberg (where coal cannot be obtained), provided proper precautions are taken.

AN OIL-PRODUCTION EXPERIMENTAL STATION.

The Midland Coal Products, Ltd.

In the year 1916 the Institution of Petroleum Technologists appointed a Sub-Committee to investigate the possibilities of producing oil from indigenous sources. The report of the Committee called special attention to the distillation of cannel coals, torbanites, and allied deposits at present unworked or not utilized. In March, 1917, the Petroleum Research Department was established under the direction of the late Sir Boverton Redwood, Bart. This Department's instructions were to make a survey of all materials from which oil could be obtained, to test such materials thoroughly and the oils obtained from them, and to make recommendations for the utilization of such materials as were selected. A fairly complete survey was made; and the recommendations concerned chiefly the use of colliery waste, cannels, torbanites, &c., that were not sold or utilized as coal. A great amount of work was done by this and other Government Departments; and a number of large-scale experiments were performed on certain gas-works and other retorts. Simultaneously with these investigations by the Government, considerable experimental work was also carried out by individual scientists and engineers, the Institution of Petroleum Technologists, and other technical bodies.

When the war came to an end in 1918, the Government Departments were closed-down, and the Midland Coal Products Company, Ltd., was formed to continue the work and to put into practical operation the results which had been achieved. The capital of the Company is £100,000, the whole of which has been subscribed privately by the coal-mining, oil, and power interests. At Kirkby-in-Ashfield, near Nottingham, the Company are erecting an experimental station, which will be formally opened early next month.

The Directors of the Company, having once determined to take-up the matter, have spared neither effort nor expense in constructing an experimental station so thoroughly equipped from every point of view of the whole problem that they venture to think the results of the tests of materials passed through the station may be regarded as decisive as to whether or not they possess possibilities of commercial treatment. Thus, the station will not only serve to prove to what use or better uses any particular bituminous material can be put, but it will also show what cannot be done with any particular material, and thereby obviate disappointments.

Since the establishment of the Company, the technical advisers have devoted much time and attention to the various types of retorts and other processes which have been brought to their notice; and the Directors believe that they have been successful in selecting those from which the best results will be obtained. In the solution of the problem it is realized that economies will be effected in the construction and upkeep of different processes, and that methods will be devised whereby the throughput will be greater. As other methods of treatment or types of retort are evolved, the Directors will continue to follow the policy of giving such inventions their consideration; and, providing they offer any possibility of success, they will erect and try them out.

The experimental station has direct connection, by means of sidings, with the Midland, Great Central, and Great Northern railway systems, and is favourably placed for receiving coals from all parts of the country. In choosing the site, the technical advisers realized the importance of having different classes of coal available for testing the retorts. The colliery at which the station is established is working seams of varying character, ranging from caking coals to cannels. At present, the Midland Coal Products Company have constructed, or have under construction, five different types of retorts, all of which are so arranged that they can be continuously fed and discharged—thus affording a maximum throughput.

The works are so designed that material for treatment is brought to one end of the yard, where it is discharged into bunkers. Each of these bunkers has a capacity of about 50 tons. From them the coal is carried to the breaker, where it is crushed to the necessary size for treatment. Travelling belts take the coal to the particular retort in which it is to be carbonized, and deposit it into a hopper over the retort. From the hopper the material is continuously fed into the retort. Residues can be dealt with in various ways—*i.e.*, briquetted, gasified in a producer, or else discharged directly into railway trucks for use as domestic fuel without briquetting.

There is a briquetting plant capable of producing 30 tons of briquettes in ten hours; and a suction-gas producer plant is used for starting-up the retorts, and for experimental purposes. When a retorting plant has been in operation for a short time, sufficient gas is produced (except with very poor material) to heat the retorts without external aid. The condensing plant is common to all the retorts, and can be used with one retort only or for more than one retort at a time. Steam is supplied by a 30-ft. by 9-ft. high-pressure Lancashire boiler, which may also be used to test the fuels produced in the process of carbonization, for their steam-raising properties. There is a laboratory (under the supervision of Dr. F. Mollwo Perkin, F.I.C., F.C.S.), where all material which goes through the retorts will be tested, and similarly all the products will be analyzed.

In carrying-out a test, all the coal or other material to be put

through the retort is first weighed. At the end of the treatment, the solid residue which comes out of the retort is weighed, and the loss in weight noted. The oil is carefully measured, as is the ammoniacal liquor recovered. For separating the oil and water there are four tanks fitted with steam-coils. The gas is scrubbed to remove the ammonia, oil-scrubbed to remove the light oils or spirit, and finally the scrubbed gas is passed forward and used for firing the retorts. The volume of gas is carefully measured and analyzed for calculation of the calorific value.

The five retorts on different principles which are now under construction are fitted with electrical pyrometers for indicating temperatures. One of the pyrometers is a recording instrument fixed in the laboratory. This latter is so arranged that pyrometers from different parts of a retort can be switched on to it, and thus the laboratory assistant can tell at any time what the temperatures are in any part of the different retorts. In most of the retorts pyrometers are fixed in four different positions. With these five plants the Company are in a position to test every class of bituminous material, from oil-shales and lignites to bituminous coals and kindred substances.

THERMAL DECOMPOSITION OF COAL AT LOW TEMPERATURES.

At a special joint meeting some time ago of the South Wales Institute of Engineers and the Society of Chemical Industry, Mr. S. Roy Illingworth, B.Sc. (Hons.), Lond., F.I.C., A.R.C.S., submitted a lengthy contribution giving particulars of researches made by him in connection with the carbonization of coal.

The paper was divided into two parts, the first of which dealt with the thermal decomposition of coal at low temperatures, and discussed the results of an investigation planned to elucidate the relative stability of certain known components of coal when subjected to carbonization under standard conditions. The investigation was undertaken from the point of view that in all its commercial usages, as fuel—in coking, gas-producer, or gas-works practice—the coal must pass under the influence of all variations in temperature comprised between normal atmospheric temperature and the maximum temperature attained in a particular operation; and that the behaviour of a coal under the influence of comparatively low temperature must play a very important, if not a fundamental, part in determining the properties of the coal. The work recorded embodied the relative behaviour of certain coals carbonized at various temperatures up to 450° C., those chosen for the purpose of the investigation being coals which, when carbonized at 950° C., yield cokes of different types. Of the four coals tested one was a gas-making coal yielding very porous coke; one a coal producing gas and metallurgical coke; and two were hard coking coals. The method of procedure was to take a known weight of each coal, ground to the same degree of fineness, and subject it to the influence of definite fixed temperatures for varying intervals of time, and then to determine the loss of weight produced. In so much as the liquid products were not completely volatile at the temperatures maintained in the work, the residue from each heating operation was washed with cold carbon tetrachloride (in order to remove the oily substances), dried *in vacuo* at 105° C., and then weighed. The loss of weight was based on the washed and dried residue. A known weight of the final residue was extracted with pyridine in a Soxhlet apparatus; and the pyridine extract, after it had been dried, was extracted with chloroform.

From figures obtained, the author pointed out, it is evident that the lowest temperature at which any of the coals tested commences to coke varies with the nature of the coal; but the results show that 400° C. may be taken as the minimum temperature of coke formation for the porous coking coals, while in all probability the dense coking coals do not coke until they attain a temperature of between 430° and 450° C. With these coals, at temperatures below 450° C., the major portions, if not all, of the constituents undergoing change are those soluble in pyridine; and the volatile matter expelled from any coal during a given period at 450° C. may be regarded as arising from the destruction of the pyridine soluble substances. Nitrogenous bodies in the coal are destroyed at 450° C. The nitrogen eliminated represents approximately 10 p.ct. of the total nitrogen present in the coal. Sulphur compounds are more readily decomposed in the highly bituminous than in the lesser bituminous coals, certain of which do not evolve volatile sulphur compounds at 450° C.

Eastern Counties Gas Managers' Association.—At the autumn meeting of the Association, which will be held in London, on Thursday, Oct. 7, no paper will be read. The programme will consist of a discussion on "Distribution Problems of To-day;" a number of members having agreed to open-up different topics under this heading.

A Large Sum for Scientific Work.—By a large majority, the shareholders in Messrs. Brunner, Mond, & Co., at an extraordinary general meeting, passed a resolution authorizing the Directors to distribute to such Universities or other scientific institutions in the United Kingdom as they may select for the furtherance of scientific education and research, £100,000 of the investment of the surplus reserve. An amendment to make the figure £50,000 was defeated.

COKE-OVEN MANAGERS' ASSOCIATION

(MIDLAND SECTION).

Visit to the Grimesthorpe Gas-Works, Sheffield.

Members of the Association last Saturday week visited the Grimesthorpe works of the Sheffield Gas Company, where they were met (in the absence of the General Manager, Mr. Ralph Halkett) by Mr. Horace Chamberlain, the Chief Engineer, who was assisted by Messrs. L. Bates, W. Heap, H. Seagrave, J. T. Sheard, and Mr. Hoggard, of the Effingham Street works.

Before the inspection, the plan of the works was explained by Mr. Chamberlain, who informed the visitors that the Company are taking coke-oven gas from the Tinsley Park plant to the extent of 1,500,000 c.ft. per diem. Speaking of the quality of the gas, which is purified at the works, he said the greatest trouble is due to the varying calorific value. In view of their obligation to provide a constant calorific value, they mixed the coke-oven gas with their own gas, in varying proportions, to attain this end.

The visitors were then divided into parties, and conducted by the staff over the works, the capacity of which was said to be 8½ million c.ft. of gas per day. Great interest was manifested in the carbonizing, coke-handling, and purifying plant—and especially in the hydraulic wagon tipper, the electric and hydraulic charging and discharging machines, and the settings of retorts. The coke used in the producers to heat the last named is 10 p.ct. of the output. Much attention was devoted to the recording calorimeter on the coke-oven gas supply, which was at the time showing a calorific value varying from 480 to 530 B.Th.U. per c.ft. The new purifiers put down to deal with the coke-oven gas consist of four boxes, with bottom discharge doors and electric telpherage for filling. These boxes measure 40 ft. by 37 ft. by 6 ft. deep. They are said to be very efficient. Another feature of interest was the plant for boosting.

Coal is received in trucks from the Midland Railway sidings adjoining the works, and drawn by the Company's locomotives either to an hydraulic wagon-tipping plant, where it is elevated and conveyed by an endless belt, 720 ft. long, and deposited into a coal-store of 15,000 tons capacity, or hauled up an incline into a second coal-store having a capacity of 24,000 tons.

The carbonizing plant consists of four ranges of retorts. Nos. 1 and 2 each contains 15 beds of tens, 22 in. by 16 in. by 20 ft., carbonizing 28 cwt. of coal per retort per day. No. 2 range is served by a Fiddes-Aldridge simultaneous charging and discharging machine electrically driven; and No. 1 range is being prepared to receive a duplicate of this machine. All the coal-elevators in these two ranges will, when complete, be driven by electric motors. Nos. 3 and 4 ranges contain respectively 15 and 12 beds of tens, 24 in. by 16 in. by 23 ft., carbonizing 32 cwt. of coal per retort per day. Both these ranges are served by one Hunter-Barnett pusher-discharger and two Arrol-Foulis chargers, driven by hydraulic pressure of 700 lbs. per sq. in. The coal-elevators and the cross conveyors serving these ranges are driven by gas-engines.

The coke from Nos. 1 and 2 ranges is discharged into cages immediately under the stage-floor. It is quenched by means of hose pipes, and then dropped into bogeys and drawn by endless wire-rope haulage to the storage ground. Nos. 3 and 4 ranges are served by electric telpherage; the coke being discharged into skips, quenched, and then hoisted and conveyed to the storage heap or to the crusher. A portion of the coke at these works is forked direct into carts and railway wagons, and the remainder passed into crushers and screened and sorted into five grades.

There are four exhausters of 125,000 c.ft. per hour capacity. All are of the rotary type, driven by vertical steam-engines. From the exhausters, the gas is forced through two Livesey washers, each capable of dealing with 5 million c.ft. of gas per day. These are connected in such a manner as to allow them to be worked in series or in parallel. The scrubbing plant consists of four tower scrubbers and two rotary washer-scrubbers. The tower scrubbers are each capable of dealing with 2½ million c.ft. of gas, and are packed with thin wood boards. The Clapham rotary washer, of 5 million c.ft. capacity, is fitted with wooden balls; and the Holmes machine of similar capacity is filled with fibre brushes. The scrubbing plant can also be worked in series or in parallel.

Six of the oxide purifying-boxes are 74 ft. by 40 ft. by 6 ft. deep, and twelve are 37 ft. by 40 ft. by 6 ft. deep. They are filled by means of hydraulic hoists and bogeys, and are provided with bottom discharge doors. There are two 250,000 c.ft. per hour capacity station-meters; and two holders of 1,750,000 c.ft. capacity, each 151 ft. 6 in. diameter and 111 ft. 6 in. high, with four lifts, the top one extending beyond the framing. There is a gas-engine driven fan of a capacity equal to 300,000 c.ft. per hour, against a pressure of 14 in., for sending surplus gas to any of the other storage stations. Five underground concrete tanks provide storage for 1,800,000 gallons of tar and liquor. Two of these tanks are reinforced, and 3 in. brick-lined.

Approximately, 1½ million c.ft. of coke-oven gas per day are received from the Tinsley Park Colliery. It is cleansed from sulphuretted hydrogen at the works, measured, and mixed with the coal gas at the outlet of the meters. The purifiers used for this gas consist of four boxes 40 ft. by 37 ft. by 6 ft. deep, fitted with

bottom discharge doors. Electric telpherage is used for filling. The capacity of the meter used is 100,000 c.ft. per hour.

The visitors were entertained at tea, after which the President of the Section (Mr. J. A. Davy) remarked upon the necessity of the co-operation of coke-oven and gas-works managers, now that more and more coke-oven gas is being used for town lighting. He also said that, had Mr. Riley, of Tinsley Park, been present, he would have congratulated him upon the quality of the gas sent out from his plant.

A hearty vote of thanks was passed to the Directors, Messrs. Halkett and Chamberlain, and their staffs; many complimentary remarks being made about the Company.

The Secretary (Mr. T. B. Smith) announced that the next visit would be on Aug. 28, to the British Tar Products works, which it was hoped would take place in conjunction with the Staffordshire Section; on Sept. 25, to the Redburn Hill coke-oven plant; and on Oct. 9, to the low-temperature carbonization plant at Barugh, near Barnsley.

It was also intimated that Mr. J. T. Price, owing to pressure of work, had resigned his position as General Secretary, and that the Council had appointed Mr. B. Wilson Haigh (Treasurer) to fill the position *pro tem.*

IMPROVEMENTS IN OIL-ENGINES.

At the July meeting of the Institution of Mechanical Engineers, Mr. F. H. Livens read a paper on "Some Lincolnshire Oil-Engines," in which he described the progress made over a series of years. He said that, with the knowledge of the efficiency which could be obtained by higher compression and more perfectly atomizing the fuel, a further step in advance was taken by Messrs. Ruston, Proctor, & Co., who designed an engine in 1913 which gave remarkably good results and is still in active service. This engine develops 25 B.H.P. with a consumption of 0·48 lb. of average fuel oil per brake horse power per hour. It starts from cold, without the use of a lamp, by compressed air of from 200 to 300 lbs. per sq. in., stored in a receiver. No adjustment of the temperature of the hot bulb or vaporizer is required, for there is none; and it is practically indifferent as to the grade of fuel oils it has to use. For tar-oils, a pilot ignition is fitted; and it can then be used as readily as an ordinary fuel oil. The consumption of pilot-oil is about 5 p.ct. of the tar-oil used at the rated working load. Though the working pressure has been increased, the wear of the major moving parts promises to be lessened; for as the thermal efficiency improves, temperatures appear to be better distributed and more manageable. Thirty atmospheres has been adopted in the new engine as a sufficient compression pressure for any fuel oil. These engines are made up to 170 H.P. in a single cylinder; and the consumption of fuel oil ranges from 0·48 lb. for 20 B.H.P., down to 0·4 lb. per B.H.P. per hour for the largest size. This is obtained with a fuel oil of ·92 sp. gr., and not less than 18,000 B.Th.U. per pound, and is equivalent to a thermal efficiency of 30 to 35 p.ct. It is claimed for this engine that it works with the same brake economy as the Diesel engine, without the complication of the two-stage air compressor for injecting the fuel; and that it is not possible for the kind of accident to happen to it which has on certain occasions wrecked Diesel engines—namely, the leakage or sticking-up of the fuel valve, causing compression to commence above atmospheric pressure, and pre-ignition, thereby producing an explosive pressure of twice or more the proper maximum.

The Human Factor in Industry.

If two parties are inseparably associated, and differences arise which cannot be ignored, peace will be best assured by frank and friendly discussion, remarked Mr. Alexander Ramsay, in the course of a paper submitted to the Institution of Mechanical Engineers. An examination of the situation leads him to the conclusion that many of the industries of the country, if not already there, are rapidly drifting into a position which is economically unsound; and that if the tendency to take out of industry more than is put into it is further pursued, or if the destructive theory is more extensively accepted by the workers that the debilitation of the present organization is, in itself, something desirable to achieve, there is before the country a period of grave economic crisis and social danger. The probability is, he says, that the situation has not got beyond a point where it can be regulated, provided the mind of industry addresses itself to the problem. The average British workman in his individual capacity is pre-eminently a sane and reasonable being; and he will rise to meet a necessity which he understands. The need for educative propaganda, therefore, is pre-eminent. It is a first necessity that the workman should be made to understand that he is getting a "square deal." Let the employers attempt to create an atmosphere of goodwill, and reciprocated goodwill can at least be possible. The shop steward cannot be regarded as the best means of propagating information which the employer believes the individual worker ought to know; and the institution of the factory journal or house organ should be much more extensively developed, either for the individual factory or a group of factories, and in its columns there should from time to time be a full consideration of the domestic problems which constantly arise.

ASSESSMENT OF GAS UNDERTAKINGS.

In a paper on the "Assessment of Engineering Undertakings," which he read before a meeting of the Society of Engineers, Mr. W. G. Cooke, A.R.I.B.A., Assoc. Inst. C.E., remarked that the whole trend of the times is to increase the financial interest of the hypothetical tenant, with the consequent effect of reducing the rateable value. About twelve years ago he valued all the gas companies in one of the Home Counties; and the amount of the tenant's capital averaged 75 p.ct. of the gross receipts. Quite recently he valued a gas company some 25 miles from London; and the tenant's capital worked-out to practically the gross receipts. There is every indication that in the near future this will be exceeded, because the statutory price to be charged for gas has, in many cases, been already reached, while there seems to be no limit to expenses.

Under the head of statutable deductions, Mr. Cooke said, dealing with repairs, that the principle of taking an average cost per 1000 c.ft. for the manufacture and distribution of gas over a series of years, and applying this average to the number of cubic feet of gas for the account year, is obviously set aside by the abnormal circumstances now prevailing. The most recently ascertained data would have to be resorted to as the basis of calculation.

To ascertain the amount of the renewal fund for the account year, one would have to make a structural valuation of the various buildings and machinery constituting the works where the gas is made. This is a heavy task, to which there is no short cut; but compared with pre-war prices, the present-day value would be from 150 p.ct. to possibly 300 p.ct. beyond the original cost. Upon this advanced sum the calculation would be based. The estimated life of each item would be unaffected. The percentage table which he submitted would be appropriate—viz., the 5 p.ct. table—would reduce somewhat the expected actuarial result.

This structural valuation of the works would form the basis for calculating the fire insurance premium which, whether the works were insured or not, would have to be allowed on the newly ascertained figures.

Coming to the mains and pipes in the district served by the company, a similar process would have to be adopted. That is to say, the lengths of the various sizes, together with the valves and services, would have to be ascertained and priced according to the rates of the market for the day. The life would be estimated according to the geological and other conditions known, and only known, by the resident engineer of the company.

The rateable value being always the chief concern of a gas company, this once agreed the cost of repairs, &c., as deduced from the company's accounts, is added to form the gross value, where the entire concern is in one parish; and where it is in more than one parish, then it is apportioned for each parish in the ratio of the rateable value for the parish.

A gas company have statutory power to increase their revenue within certain limits, and thus to counteract to some extent the effect of increased expenses; but so abnormal have been the recent changes in all departments of gas working, that nothing short of a reduction of the basis for parish rates will quite meet the case. A water company are still worse off as regards their revenue, because it is derived chiefly from a percentage on the rateable value of the premises supplied with water, and is not therefore elastic; while the company would have to bear the additional expenses. There is probably no gas company or water company whose assessment has been settled in recent years which could not justly show that it was excessive from one cause or the other, or perhaps from both. To make the position quite clear, it should be mentioned that, though the undertaking may be, and, as a rule, is, the property of an incorporated company, it is in the capacity of tenant that the company is rated. This dual position in no way affects the question; for it has to be assumed in law that the hereditament to be rated is to be let from year to year on the statutory terms, and among all possible occupiers the actual occupier is to be included.

The most obvious way, therefore, for any company at the present time to get relief is to object to the rateable value as excessive, on the ground of the insufficiency of the statutable deductions; and formal notice having been given, the Assessment Committee are limited in their action. That is to say, they must start with the gross value shown in the valuation list in force in the parish, and work downwards. They cannot increase the gross value. Nor, assuming the company to appeal to Quarter Sessions, can the Court admit evidence tending to show that the gross value has been underestimated.

Oil for Gas Making in America.—In pursuance of a resolution adopted at a recent emergency meeting in New York of gas company officials, Mr. G. B. Cortelyou (the President of the American Gas Association) has selected a committee of nine representative men in the gas industry to confer with representatives of oil producing and refining interests, in an effort to obtain preference in allocation of oil for gas-making purposes. There is at present an unprecedented increase in the use of oil for purposes other than the manufacture of gas; but it is hoped that a favourable understanding may be come to with the oil interests, so as to safeguard the supply of gas, which is now threatened by the shortage of oil and the scarcity of coal.

THE GAS REGULATION ACT.

THE Royal Assent was given last Wednesday to the Gas Regulation Bill, the various stages of which through both Houses of Parliament have been fully reported in the pages of the "JOURNAL." Readers will have noted that from time to time various amendments have been made in the measure; and the precise number and extent of these may be gathered by comparing the Bill in its final form [as reproduced below] with the original draft, which appeared on p. 425 of the "JOURNAL" for May 25 last.

PRICE AND QUALITY OF GAS.

POWER TO SUBSTITUTE NEW BASIS OF CHARGES.

1.—(1) The Board of Trade may, on the application of any gas undertakers, by order, provide for the repeal of any enactments or other provisions requiring the undertakers to supply gas of any particular illuminating or calorific value, and for substituting power to charge for thermal units supplied in the form of gas.

(2) An Order under this section may provide for modifying the statutory or other provisions affecting the charges which may be made by the undertakers by substituting for the standard or maximum price authorized under those provisions a standard or maximum price for each 100,000 B.Th.U. (in this Act referred to as a "therm").

(3) The standard or maximum price per therm fixed by the Order shall be a price corresponding as nearly as may be to that fixed by those provisions for each 1000 c.ft., but with such addition as appears to the Board reasonably required in order to meet the increases (if any) due to circumstances beyond the control of, or which could not reasonably have been avoided by, the undertakers, which have occurred since the 30th of June, 1914, in the costs and charges of and incidental to the production and supply of gas by the undertakers. And the Order may make such modifications of any provisions whereby the rate of dividend payable by the undertakers or any other payment is dependent on the price of gas supplied as appear to the Board to be necessary.

Provided that if at any time it is shown to the satisfaction of the Board of Trade that the costs and charges of and incidental to the production and supply of gas have substantially altered from circumstances beyond the control of, or which could not reasonably have been avoided by the undertakers, the Board may, if they think fit, on the application of the undertakers or of the local authority or, where the local authority are the undertakers, of twenty consumers, make an amending Order correspondingly revising the powers of charging authorized by the original Order.

(4) An Order under this section—

(*a*) shall prescribe the time when, and the manner in which, the undertakers are to give notice of the calorific value of the gas which they intend to supply (in this Act referred to as the declared calorific value), and shall require that such notice shall at the same time be published in the London, or Edinburgh, or Dublin Gazette; and

(*b*) shall require the undertakers, in the case of alteration in the declared calorific value, to take at their own expense such steps as may be necessary to alter, adjust, or replace the burners in consumers' appliances in such manner as to secure that the gas can be burned with safety and efficiency, except in the case of any consumer who objects to such alteration, adjustment, or replacement by the undertakers; and

(*c*) may prescribe, subject to such conditions as the Board may think necessary, the additional charge per therm which the undertakers may make in respect of gas supplied by means of prepayment meters; and

(*d*) may make such supplemental and consequential provisions as appear necessary to give full effect to the Order; and

(*e*) shall come into operation on such date as may be fixed by the Order; and

(*f*) shall have effect as if enacted in this Act.

(5) If within two years after the passing of this Act any undertakers have not applied to the Board of Trade for an Order under this section, the Board of Trade may, after giving not less than three months' notice to the undertakers, make an Order applying to those undertakings, which shall have the same effect as an Order made on the application of the undertakers.

(6) Before making any Order under this section, the Board of Trade shall where the Order is made on the application of the undertakers require the undertakers to give and in any other case shall themselves give public notice in the London or Edinburgh or Dublin Gazette as the case may be in such other manner as the Board may consider best adapted for informing persons affected of the application for or proposal to make an Order, and of the maximum or standard price per therm proposed, and as to the manner in which and time within which objections may be made, and shall consider any objection which may be duly made, and shall, where they think it expedient to do so, cause an inquiry to be held. The notice to be given under this section shall include notice to the local authority.

(7) The calorific value of gas means, for the purpose of this Act, the number of British thermal units (gross) produced by the combustion of 1 c.ft. of the gas measured at 60° Fahr. under a pressure of 30 in. of mercury and saturated with water vapour.

COMPOSITION AND PRESSURE OF GAS TO BE SUPPLIED.

2.—(1) Where an Order under this Act has been made affecting any undertakers, the gas supplied by those undertakers, in addition to conforming to the conditions prescribed in the Order, shall comply with the following conditions—that is to say:

(i) it shall not contain any trace of sulphuretted hydrogen when tested in accordance with this Act;

(ii) it shall be supplied at not less than the minimum permissible pressure;

Provided that the foregoing requirements shall not apply as respects a separate supply of gas by any undertakers for industrial purposes only; but an Order may impose such other conditions with regard to gas supplied by those undertakers for those purposes as appear necessary to the Board of Trade.

(2) The minimum permissible pressure shall be such pressure in any main, or in any pipe laid between the main and the meter having an internal diameter of 2 in. and upwards, as to balance a column of water not less than 2 in. in height except as may be otherwise provided by the Order relating to any undertaking, and different minima may be specified for different parts of an undertaking, or for gas of different calorific values.

(3) Where any undertakers are, at the time when an Order is made with respect to them under this Act, under a statutory obligation to comply with conditions in relation to pressure which are in excess of the provisions as to pressure contained in this section, the Order shall make such provisions as appear necessary to the Board of Trade for preserving these conditions; and this Act shall, in its application to those undertakers, have effect as though such last-mentioned provisions were substituted for the provisions of this section as to pressure.

(4) The Board of Trade shall as soon as may be after the passing of this Act cause inquiries to be held into the question whether it is necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be supplied in gas used for domestic purposes, and into the question whether it is necessary or desirable to prescribe any limitations of the proportion of incombustible constituents which may be supplied in gas and may, if on any such inquiry it appears desirable, make one or more Special Orders under this Act prescribing the permissible proportion in either case; and any such Special Order may have effect either generally or as regards particular classes of undertakings, and the provisions of the Special Order shall have effect as if they were enacted in this section.

RESTRICTION ON POWER TO CHARGE FOR THERMAL UNITS.

3.—It shall not be lawful for any person to charge for the supply of gas according to the number of British thermal units supplied unless authorized to do so under this Act or by Special Act of Parliament.

TESTING OF GAS.

APPOINTMENT OF GAS REFEREES AND EXAMINERS.

4.—(1) The Board of Trade shall appoint three persons, at least one of whom shall be a person having practical knowledge and experience in the manufacture and supply of gas, to act as Gas Referees.

The Board of Trade shall also appoint a competent and impartial person to be Chief Gas Examiner.

The Gas Referees and the Chief Gas Examiner shall hold office for such time and on such conditions as the Board of Trade may direct, and may with the consent of the Board of Trade appoint such assistants as may be necessary for the proper discharge of their duties.

(2) Two of the Gas Referees shall be a quorum, and at least two of the Gas Referees shall concur in every act or determination of the Gas Referees.

(3) The local authority may, unless they are themselves the undertakers, appoint a competent and impartial person to be a gas examiner, and subject to the prescription of the Gas Referees to test the gas and the pressure at which the gas is supplied:

Provided that—

(*a*) for the purposes of this section a gas examiner may be appointed to act on behalf of any number of local authorities; and the local authorities may enter into such arrangements as they think fit in regard to the joint appointment and employment of such gas examiner; and

(*b*) any county council may, if they think fit, with the consent of any other local authority within the county, appoint a gas examiner, who shall have the same powers as if he were appointed by that local authority.

(4) Where no gas examiner is appointed by the local authority, or where the testing of gas is imperfectly attended to, quarter sessions, on the application of not less than five consumers, may appoint a competent and impartial person to act as gas examiner, who shall have the same powers and perform the same duties as if he were appointed by the local authority; and the remuneration and expenses of the gas examiner up to the amount approved by quarter sessions shall be paid by the local authority.

POWER TO PRESCRIBE TESTS.

5.—(1) The Gas Referees shall prescribe—

(*a*) the places and times at which and the apparatus and method by which tests, whether continuous or intermittent, shall be made to ascertain whether any undertakers with respect to whom an Order has been made under this Act are supplying gas in accordance with their obligations; and

(*b*) the method by which any such apparatus shall be verified; and

(*c*) the time and form of the reports to be made by the gas examiner to the Gas Referees and the local authority or quarter sessions by whom he is appointed, and to the undertakers, and the means by which the results of the tests shall be made available to the public:

Provided that, unless otherwise agreed between the undertakers and the authority by whom the gas examiner is appointed, any testing-place provided by the undertakers in pursuance of any Special or other Act of Parliament relating to the undertaking shall be deemed to be a prescribed testing-place under this section; but the Gas Referees may,

if they think fit, prescribe any additional testing-place in respect of that undertaking.

(2) The prescribed apparatus shall, in case of any undertakers who have sold in the preceeding year more than 100,000,000 c.ft. of gas, and in any other case in which it appears necessary to the Gas Referees, include a calorimeter for the production of a continuous record of the calorific value of the gas which is being supplied.

(3) Any undertakers with respect to whom an Order has been made under this Act shall provide and maintain to the satisfaction of the Referees the prescribed testing-places and apparatus, and shall give any gas examiner access to any testing-place for the proper execution of his duty.

(4) A representative of the undertakers may be present on any occasion on which the gas examiner inspects, or alters, adjusts, or replaces the testing apparatus or tests the gas, but shall not interfere with the inspection, alteration, adjustment, or replacement, or test.

For the purpose of this subsection the gas examiner shall, in cases where the testing-place is situated elsewhere than on the works of the undertakers, give to the undertakers reasonable notice of the time at which he will attend at the testing-place.

(5) The Gas Referees may at any time where it appears to them necessary for the proper execution of their duties enter upon and inspect any of the works of the undertakers; and the undertakers shall afford them and their assistants full facilities for this purpose, and shall furnish the Referees with such information with regard to the position of the mains and pipes of the undertakers, and with regard to any other matter, as the Referees may reasonably require.

APPEALS TO CHIEF GAS EXAMINER.

6.—(1) If the undertakers or the local authority think themselves aggrieved by any prescription of the Gas Referees, they may, within one month from the making of such prescription, appeal to the Chief Gas Examiner, who, after hearing the parties and any other body or person appearing to him to be interested, may confirm (with or without amendment) or annul the prescription; and the decision of the Chief Gas Examiner shall be final and conclusive.

(2) If the undertakers think themselves aggrieved by any report of a gas examiner, they may, within seven days, appeal to the Chief Gas Examiner, who may confirm (with or without amendment) or annul the report, and whose decision, after hearing the parties, shall be final and conclusive.

(3) The report of a gas examiner (including any such report as amended by the Chief Gas Examiner) showing any failure to comply with the provisions of this Act or any Order thereunder as to the calorific value, purity, pressure, or composition of gas, shall be conclusive evidence of the liability of the undertakers to a forfeiture in respect thereof.

(4) Any decision of the Chief Gas Examiner purporting to have been signed by him shall for all purposes and to all intents be *primâ facie* evidence of the due making and signing thereof without proof of such signature.

REMUNERATION AND EXPENSES OF GAS REFEREES.

7.—(1) The salaries, remuneration, pensions, and gratuities of the Chief Gas Examiner and the Gas Referees and their assistants shall be such as the Board of Trade, with the consent of the Treasury, may fix.

(2) (*a*) Any such salaries, remuneration, pensions, or gratuities; and

(*b*) any expenses of the Chief Gas Examiner and the Gas Referees in the execution of their duties or powers under this Act; and

(*c*) any expenses of the Board of Trade which in the opinion of the Treasury are directly attributable to the execution of their powers and duties under this Act;

shall be paid out of the fund established under this section:

Provided that during the first two years after the passing of this Act the expenditure for the purposes aforesaid shall, to the extent that may be necessary, be paid out of moneys provided by Parliament; but such payments shall be treated as advances, and shall be repaid out of that fund, with interest at such rate and by such instalments, as the Treasury may fix in the next three succeeding years.

(3) Any undertakers with respect to whom an Order under this Act has been made, shall, on or before the 1st of April in each year, pay to a fund (to be called the gas fund) a contribution not being at the rate of more than 3s. for each million cubic feet of gas sold by them in the preceding year; and the Treasury may determine that that fund shall be a public fund within the meaning of the Superannuation Act, 1892.

(4) The Board of Trade shall not later than the 15th of January in each year prescribe the rate at which such contribution shall be payable for that year (which shall not exceed the rate reasonably required to meet the estimated expenditure for the year); and the manner in which, and the account to which, the contribution shall be paid, and the amount payable by the undertakers shall be a debt due by the undertakers to the Crown, and shall be recoverable accordingly with costs.

(5) The Board of Trade shall as soon as may be after the 31st of March in every year cause the accounts of the gas fund for the preceding year to be laid before Parliament.

FORFEITURE AND PENALTIES.

PENALTIES FOR FAILURE TO COMPLY WITH PRESCRIPTION OF GAS REFEREES.

8.—If the undertakers fail to comply with any lawful prescription of the Gas Referees, or to provide or maintain any testing-place, apparatus, or materials, or any other matter or thing prescribed therein, or to afford to the gas examiner or Gas Referees access to any testing place or works in accordance with the requirements of this Act, or to afford or furnish any facilities or information in accordance with the requirements of this Act, the undertakers shall be liable on summary conviction to a fine not exceeding £25, or in the case of a continuing offence £25 for each day after such conviction during which such offence continues:

Provided that no proceedings under this section shall be taken—

(*a*) unless the Board of Trade, after giving the undertakers an opportunity of being heard, consent thereto; and

(*b*) in the case of the failure to comply with any lawful prescription, until after the expiration of the period within which the undertakers may under this Act appeal against the prescription; or

(*c*) if the undertakers have appealed as aforesaid, unless or until either such appeal is withdrawn or the Chief Gas Examiner has given a decision thereon.

FORFEITURE FOR DEFICIENT CALORIFIC VALUE, &c.

9.—(1) If on any day for a period of two hours or upwards the calorific value of gas supplied by any undertakers, ascertained in accordance with the provisions of this Act, is more than 5 p.ct. below the declared calorific value, the undertakers shall be liable on summary conviction to a forfeiture not exceeding £5 for every complete 1 p.ct. by which the calorific value is deficient in excess of such 5 p.ct.:

Provided that, where there is no continuous record of the calorific value of the gas supplied by any undertakers, if on any occasion of testing the calorific value at any testing-place is found to be more than 5 p.ct. below the declared calorific value a second testing shall be made on the same day after an interval of not less than one hour, and the mean of the two testings shall be deemed for the purposes of this subsection to be the calorific value of the gas supplied by the undertakers at that testing-place for a period of two hours ascertained as aforesaid.

(2) If on any occasion the gas does not conform to the provisions of this Act or any Order made thereunder as to purity or pressure, the undertakers shall be liable on summary conviction to a forfeiture not exceeding £10.

(3) The undertakers shall not be liable to any forfeiture under this section in any case where they show that the deficiency or failure was due to circumstances not within their control, nor shall the undertakers be liable for more than one forfeitnre in respect of any one day for any deficiency in calorific value, composition, or pressure of gas supplied from any one works.

(4) If in any quarter the average calorific value of the gas supplied by any undertakers, ascertained in manner prescribed by the Gas Referees, is less than the declared calorific value, a sum which the Chief Gas Examiner shall determine to be as nearly as may be the amount by which the revenue of the undertakers has been improperly increased shall—

(*a*) if the undertakers are a local authority, be applied towards a reduction in the price of gas in the next or some succeeding quarter; and

(*b*) in any other case, be deducted from the amount applicable to payment of dividend on the ordinary capital of the undertakers for the year or half year in which such quarter occurs, and carried forward to the credit of the revenue account for for the next following year or half year in addition to any other amount which would otherwise have been so carried forward, and the dividend which the undertakers may pay on their ordinary capital in respect of such first-mentioned year or half year shall be correspondingly reduced; and

(*c*) in every case the amount so ascertained shall be shown in the accounts of the undertakers as a separate item until the undertakers have shown to the satisfaction of the Board of Trade that it has been applied to a reduction in the price of gas.

For the purposes of this provision, the expression "quarter" means the three months commencing on the 1st of January, the 1st of April, the 1st of July, and the 1st of October in any year.

(5) Proceedings against the undertakers in respect of any forfeiture incurred under this Act may be commenced at any time within three months after the date of the report of the gas examiner, or after the date of the report of the Chief Gas Examiner on appeal, or, in the event of the undertakers duly appealing to the Chief Gas Examiner and withdrawing the appeal, within three months after the date of the receipt of notice of such withdrawal.

(6) If, on an appeal to the Chief Gas Examiner, he certifies that the default of the undertakers is not substantial or not due to the careless conduct of the undertakers or of their servants, no summary proceedings shall be taken in respect of the default; but the Chief Gas Examiner may by order determine the amount (not exceeding the amount prescribed by subsection (1) or subsection (2) of this section as the forfeiture for the default) of the forfeiture to be paid by the undertakers, and any such Order shall have effect as if it were an order of a Court of Summary Jurisdiction.

SPECIAL ORDERS.

POWER TO MAKE SPECIAL ORDERS.

10.—(1) Anything which under the Gas and Water Works Facilities Act, 1870, or any Act amending the same, may be effected by a Provisional Order confirmed by Parliament may, so far as those enactments relate to gas, be effected by a special order made on the application of any local authority, company, or person by the Board of Trade under and in accordance with the provisions of this section, and for the purposes of the powers conferred by this section the Gas and Water Works Facilities Act, 1870, shall have effect as though section 15 thereof, which excludes the Metropolis from the operation of the Act, were omitted therefrom.

(2) Without prejudice to the generality of the powers conferred by this section the Board of Trade may, by any such Special Order—

(*a*) empower any undertakers to obtain a supply of gas in bulk from any source whether situated within or without their authorized limits of supply:

(*b*) empower any undertakers to give a separate supply of gas for industrial purposes within their authorized limits of supply:

(*c*) authorize any local authority which may be authorized to supply gas within their district to supply gas outside the district in any area which is not supplied with gas by any other under-

takers or which is within the area of supply of any undertakers whose undertaking has been acquired by such local authority:

(*d*) authorize arrangements for the purchase by agreement, joint working, or amalgamation of undertakings, including necessary provisions with regard to the capital of the combined undertaking, the vesting of the property and rights of the purchased or amalgamated undertakings, and other necessary incidents and consequences of purchase, amalgamation, or joint working:

(*e*) authorize the establishment of superannuation, pension, and other like funds:

(*f*) authorize the raising of capital or the borrowing of money for any of the purposes aforesaid:

(*g*) make provision for the purchase or redemption (out of revenue or otherwise) and cancellation of debentures, debenture stock, mortgages, or bonds, or of obsolete or unproductive capital, or capital not represented by available assets:

(*h*) modify or amend the provisions of any Special Act or other provision relating to the undertaking affected by the Special Order as may be necessary to provide for the proper and efficient conduct of the undertaking:

(*i*) make such supplemental and consequential provisions as appear necessary to give full effect to the Order.

(3) Sections 80 and 81 of the Factory and Workshop Act, 1901, which relate to the making of regulations under that Act, as set out and adapted in the schedule to this Act, shall apply to the making of Special Orders under this Act.

(4) Before any Special Order under this Act is made, it shall be laid in draft before both Houses of Parliament; and such Order shall not be made unless both Houses, by resolution, approve the draft, either without modification or addition or with modifications or additions to which both Houses agree. But upon such approval being given, the Board of Trade may make the Order in the form in which it has been approved; and the Order on being so made shall be of full force and effect.

(5) For the purposes of any Act of Parliament—whether passed before or after this Act, which refers directly or indirectly to a Special Act conferring powers on gas undertakers—a Special Order under this Act shall be deemed to be a Special Act.

GENERAL.

FEES FOR EXAMINATION OF METERS.

11.—The fees for the examination, comparison, and testing (with or without stamping) of meters, shall be such as may be determined from time to time by the Board of Trade; and section 19 of the Sale of Gas Act, 1859, is hereby repealed:

Provided that the fees fixed by the said section shall (notwithstanding such repeal) continue to be chargeable, unless and until altered by the Board of Trade under the powers conferred by this section.

APPLICATION OF ACT, 4 EDW. 7., C. 28, S. 6.

12.—The powers and duties of the Board of Trade under sections 5 and 6 of the Weights and Measures Act, 1904, in relation to regulations with respect to measuring instruments and certificates of suitability for use of certain appliances, shall extend to instruments for measuring gas and patterns thereof; and those sections shall have effect accordingly.

Provided that for the purposes of the said section 6 as applied by this section, the expression "inspector" shall mean an inspector of gas-meters under the Sale of Gas Act, 1859.

METERS TO BE STAMPED.

13.—All meters by means of which gas is supplied by any undertakers to any consumer shall be stamped in accordance with regulations made by the Board of Trade under their powers in that behalf; and if any undertakers supply gas by means of any meter which is not so stamped, they shall be liable on summary conviction to a fine not exceeding £10.

QUALIFICATION FOR APPOINTMENT AS INSPECTOR OF METERS.

14.—(1) The Board of Trade shall provide for the holding of examinations for the purpose of ascertaining whether applicants for the post of inspector of meters under section 4 of the Sale of Gas Act, 1859, nominated by the appointing authority, possess sufficient practical knowledge for the proper performance of the duties of that post, and for the grant of certificates to persons who satisfactorily pass such examination.

(2) A person shall not, after the passing of this Act, be appointed to act as an inspector of meters as aforesaid unless he has obtained such certificate as aforesaid.

(3) If any person, not being an inspector duly appointed under the Sale of Gas Act, 1859, acts as such inspector, he shall be liable to a fine not exceeding £10, or, in the case of a second or subsequent offence, £20.

(4) There shall be charged in respect of the examinations under this section such fees as the Board of Trade, with the concurrence of the Treasury, from time to time fix; and all such fees shall be dealt with in such manner as the Treasury from time to time direct.

ACCOUNTS AND RETURNS.

15.—(1) All gas undertakers shall furnish to the Board of Trade at such times and in such form and manner as the Board may direct an annual account, and such statistics and returns as the Board may require.

(2) Within seven days of the date on which the annual account is sent to the Board of Trade, the undertakers shall furnish a copy thereof to the local authority, and shall place copies on sale at their principal office at a price not exceeding 1s. per copy.

(3) If any undertakers fail to comply with the provisions of this section, they shall be liable on summary conviction to a fine not exceeding 40s. for each day during which the default continues.

(4) The provisions of this section shall be substituted for the provisions of section 38 of the Gas-Works Clauses Act, 1847, and of section 35 of the Gas-Works Clauses Act, 1871, in so far as such provisions are incorporated in the special Act of the undertakers.

POWER TO MAKE RULES.

16.—(1) The Board of Trade may make Rules in relation to applications and other proceedings under this Act and to the payments to be made in respect thereof, and to the publication and service of notices and the publication of advertisements, and the manner in which and the time within which representations or objections with reference to any application or other proceeding are to be made, and to the holding of inquiries in such cases as they may think it advisable, and to the costs of such inquiries, and to any other matters arising in relation to their powers and duties under this Act.

(2) Any rules made in pursuance of this section shall be laid before Parliament as soon as may be after they are made, and shall have the same effect as if enacted in this Act.

EXERCISE OF POWERS OF BOARD OF TRADE.

17.—All things required or authorized under this Act to be done by the Board of Trade may be done by the President or Secretary or Assistant Secretary of the Board, or any person authorized in that behalf by the President of the Board.

DEFINITIONS.

18.—For the purposes of this Act—

The expression "local authority" means the Common Council of the City of London and any county, county borough, or urban district council, and in relation to any gas undertaking means any such local authority the whole or any part of whose area is within or partly within the limits of supply of the undertakers;

The expression "gas undertakers" or "undertakers" means any local authority, company, body, or person authorized to supply gas by any Act of Parliament, or any Order having the force of an Act of Parliament;

The expression "quarter sessions" in relation to any undertaking means the Court of Quarter Sessions for the county, division or place in which the gas-works of the undertaking are situate.

SUPERSESSION OF EXISTING ENACTMENTS.

19.—Any provisions of this Act or any Order made thereunder shall have effect in lieu of any provisions to the same effect or inconsistent therewith in any Act relating to the testing of gas-measuring instruments, or in any Act or Order having the force of an Act relating to an undertaking with respect to which an Order has been made under this Act.

EXPENSES OF LOCAL AUTHORITIES.

20.—The expenses of a local authority under this Act shall be defrayed, in the case of the common council of the City of London out of the general rate, in the case of a county council as payments for special county purposes made in respect of the parishes which are wholly or partly within the limits of supply of any gas undertakers in respect of which the county council have power to appoint a gas examiner, and in the case of other councils as expenses incurred in the administration of the Public Health Acts, 1875 to 1908.

APPLICATION TO SCOTLAND AND IRELAND.

21.—(1) In the application of this Act to Scotland references to the sheriff shall be substituted for references to quarter sessions, the expression "local authority" means the county council and the town council, and the expenses of a local authority under this Act shall be defrayed, in the case of a county council, out of the general purposes rate. Provided that, notwithstanding anything in the Local Government (Scotland) Act, 1889, the ratepayers of any police burgh shall not be assessed by the county council for any such expenses, and in the case of a town council out of the burgh general assessment or police rate.

(2) In the application of this Act to Ireland, a reference to the Public Health (Ireland) Acts, 1878 to 1919, shall be substituted for the reference to the Public Health Acts, 1875 to 1908; and the expenses of a county council shall be defrayed out of the county fund and raised as a district charge or district charges over any county district or districts which are wholly or partly within the limits of supply of any gas undertakers in respect of which the county council have power to appoint a gas examiner.

SHORT TITLE.

22.—This Act may be cited as the "Gas Regulation Act, 1920."

SCHEDULE.

PROVISIONS OF THE FACTORY AND WORKSHOPS ACT, 1901, APPLIED TO SPECIAL ORDERS MADE UNDER THIS ACT.

80.—(1) Before the Board of Trade make any Special Order under this Act, the undertakers concerned shall publish, in such manner as the Board may think best adapted for informing persons affected, notice of the application for the Order, and of the place where copies of the Draft Order may be obtained, and of the time (which shall be not less than 21 days) within which any objection made with respect to the Draft Order by or on behalf of persons affected must be sent to the Board of Trade.

(2) Every objection must be in writing and state—

(*a*) the specific grounds of objection; and

(*b*) the omissions, additions, or modifications asked for.

(3) The Board of Trade shall consider any objection made by or on behalf of any persons appearing to them to be affected which is sent to them within the required time.

(4) Where the Board of Trade do not amend or withdraw any Draft Order to which any objection has been made, then (unless the objection either is withdrawn or appears to them to be frivolous) they shall, before making the Order, direct an inquiry to be held in the manner hereinafter provided, and may, after considering the report of the person who held the inquiry, make the Order either without modification or subject to such modification as they think fit, or may refuse to make the Order.

81.—(1) The Board of Trade may appoint a competent and impar-

tial person to hold an inquiry with regard to any Draft Order, and to report to them thereon.

(2) The inquiry shall be held in public, and any objector and any other person who, in the opinion of the person holding the inquiry, is affected by the Draft Order, may appear at the inquiry either in person or by counsel, solicitor, or agent.

(3) The witnesses on the inquiry may, if the person holding it thinks fit, be examined on oath.

(4) Subject as aforesaid, the inquiry, and all proceedings preliminary and incidental thereto, shall be conducted in accordance with rules made by the Board of Trade.

(5) The fee to be paid to the person holding the inquiry shall be such as the Board of Trade may direct.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Southend-on-Sea Gas Bill was reported, with amendments, read the third time, with the amendments, and passed.

The House approved the draft of the Ministry of Health (Transfer of Powers as to Gas Undertakings) Order.

Bills Royal Assented.

Among measures which received the Royal Assent last Wednesday were the Gas Regulation Bill, the Gas Provisional Orders Bill, the Gas and Water Provisional Orders Bill, the Ministry of Health Provisional Order (Gas) Bill, the Newtownards Urban District Council Bill, the Redcar Urban District Council Gas Bill, the Pontypridd Urban District Council Bill, the South Metropolitan Gas Bill, the Halifax Corporation Bill, the Tredegar Urban District Council Bill, the Blackpool Improvement Bill, the Coventry Corporation Bill, the Brighton and Hove Gas Bill, the South Suburban Gas Bill, and the Uxbridge and Wycombe District Gas Bill.

HOUSE OF COMMONS.

Progress of Bills.

The Uxbridge and Wycombe District Gas Bill was read the third time, and passed, with amendments.

The Fertilizers (Temporary Control of Export) Bill was read a second time, and committed to a Committee of the whole House.

Inverness Water and Gas Provisional Order Bill.

A Bill to confirm a Provisional Order under the Burgh Police (Scotland) Act, 1892, relating to Inverness Water and Gas was presented by Mr. Munro, read the first time, and referred to the Examiners.

Scientific Research.

Included in the Civil Service Estimates which came before the House last week were the sums of £333,298 for scientific and industrial research, and £115,416 for scientific investigation, &c.

Newcastle Gas Company's Reduction.—A letter has been received by the Gateshead Town Council from the Newcastle-upon-Tyne and Gateshead Gas Company, intimating that, in consequence of the high prices obtained for residuals, the Company have decided to reduce the price of gas by 10d. per 1000 c.ft., making it 2s. 6d., less discount.

Price of Gas at Southport.—At the present time the charge for gas at Southport is 4s. per 1000 c.ft.; but the Corporation have applied for permission to increase the maximum charge to 6s., and are awaiting official sanction. The extra 6s. a week the gas-workers are now receiving will absorb a very considerable portion of the additional 2s.; while, if their wages are increased beyond the present figure, it is estimated that the whole of the 2s. will be required.

The Gas-Mantle Business of Messrs. Curtis's and Harvey.—It has been decided by the Directors of Messrs. Curtis's and Harvey, Ltd., that it would be beneficial to the Company if a separate concern were formed to work the incandescent gas-mantle branch of the business, together with the factories in which the mantle business has been carried on; and they propose that a new Company be registered to take over this part of their business in exchange for fully-paid shares of the new Company. It is expected that other important concerns may also be acquired at a later date.

Grantham Gas Company.—Mr. J. G. Thompson presided at the 92nd half-yearly meeting of the Company, when a loss of £74 was reported on the six months' working, notwithstanding which the Directors recommended payment of the statutory dividend of 5 p.ct. per annum on the consolidated stock (less income-tax), and the transfer from the reserve to the profit and loss account of a sum sufficient to meet this dividend. The balance of the reserve fund would then stand at £5721, compared with £9841 on June 30, 1914. The further increase in wages as from May last would amount to about £1300 a year; but the Directors were relying on the Gas Regulation Act to enable the Company to increase the price of gas, so as to render unnecessary any further resort to the reserve fund in order to provide dividends. The Chairman referred to the serious nature of the financial statement; pointing out that, compared with 1914, the total increased expenditure was £9435. The increased price of gas had brought in £6887, showing a net loss of £2548. Colonel A. Hutchinson explained that the old profit-sharing scheme had ceased; but the Directors had agreed to another arrangement by which the Company would be practically making a present of a substantial sum of money to the men. The balance-sheet was adopted.

MISCELLANEOUS NEWS.

THE GAS-WORKERS' DISPUTES.

Views at Headquarters.

The position in regard to the dispute relating to the wages of gas-workers was the subject of statements in the daily papers early last week. There was reported then a declaration by Mr. James O'Grady, M.P., Secretary of the National Federation of General Workers, that pressure was being brought to bear on the employers to meet the Negotiating Committee of the Federation to discuss the claim for a further national increase of 1s. per day. "I regret to say," remarked Mr. O'Grady, "that the employers have so far refused to meet us to consider the new claim. They are putting up to us the question of grading and zoning. But that is another issue, and we feel we must deal with the wages claim increase first, and get that out of the way." He said the position was very serious, owing to the attitude taken by the employers. If no arrangements were made for a conference, or the employers gave them a blank refusal, it would be necessary to call together the Negotiating Committee of the Federation in London to consider the position. "We shall then have to decide," said Mr. O'Grady, "whether another ballot shall be taken of the men." He complained that the attitude of the employers was provocative. There could be no possible objection, he said, to a conference to discuss the claim.

It was stated on Friday by the Federation of General Workers that there had been no response from the employers to the request for a joint conference; and, in view of this, the Negotiating Committee had been summoned to meet in London yesterday [Tuesday] to decide on the next step.

After this meeting had been arranged, it was announced that the Federation of Gas Employers would meet to-day [Wednesday] to discuss the situation. "The feeling of the men in favour of drastic action is growing," said Mr. O'Grady; "but in face of the employers' meeting, it is impossible to say how far they will go. All depends on whether we receive an offer, and, if so, what the offer is. If we receive one worth considering, negotiations will be opened-up, and the danger of a strike will have receded."

An official of the employers' organization said the statement that the employers had declined to meet the federation was "in part correct;" but there were circumstances requiring explanation from the employers' standpoint, and a statement was in preparation.

An Amicable Arrangement Come to at Hereford.

Since the July meeting of the Hereford City Council, when it was decided [*ante*, p. 89], on the recommendation of the Gas Committee, not to grant employees the national award increase of 6s. a week or 1s. per shift, the Committee have had a friendly conference with the men. As the increase had been granted by practically every other gas undertaking, there was a strong feeling among the men that they were somewhat hardly used; and in view of the fact that, since the last meeting, the Committee were able to take a more favourable view of their financial position, they recommended at last week's meeting of the Council that the increase be granted to the employees as from the date of the award. They reported that, if this recommendation was adopted, the men would give an undertaking that no further increase would be asked for until after March 25 next, unless the cost of living should be materially increased.

It was explained by Alderman Witts that there were two main factors which had called for the production of the supplementary report. In the first place, they had a report just passed in connection with the Electricity Committee, whereby the Council on a national award had considerably advanced the salaries of the higher paid men. On the top of this they had a report coming from the Finance Committee asking the Council to agree to substantial increases in the salaries of the higher officials at the Town Hall. So far as the Gas Committee were concerned, these two reports had broken the camel's back. The Gas Committee could not be mere spectators with regard to these increases. When they met the men in conference, they were most favourably impressed by their attitude. Indeed, he might say that they were profoundly impressed by the information given by the men relative to the cost of living at the present time, and the insufficiency of their wages to meet it. The men proved conclusively that it was a most difficult problem to live upon the wages they were getting. On the top of this, they were faced with a further national demand of 6s. more per week, in addition to the 6s. under discussion. He must say that the men had met the Committee in a most generous way. They had given them an undertaking that, whatever further national demand was made, they would not come to the Committee again until after March 25 next, and that then they would not ask for more wages unless the cost of living had materially increased. They had before them a signed document from the men to this effect. He was quite aware that he had said they could not afford to pay the increase. It was perfectly true; and he had no wish to withdraw the statement now. The men had, however, said they would heartily co-operate with the Committee in trying to make the financial position a much better one than in the past.

More than one speaker expressed appreciation of the services of Alderman Witts; and the Committee's recommendations were adopted by the Council.

Wigan Gas Strike Over.

After being out on strike for ten days, the employees at the Wigan Corporation Gas-Works decided on Saturday to return to work under protest.

The men held a meeting on Tuesday of last week at which they decided to continue the strike until their demand for the full 10s. per week increase, or 4s. additional to the 6s. already granted under the national award, had been conceded. During the morning the following telegram was received from Mr. J. Williams, the Manchester District Official of the Gas-Workers' Union: "Executive National Union General Workers strongly advise men to resume work at once. No settlement possible while out on strike." This was dispatched by

messenger to be read at the meeting of the men; but the decision to continue the strike had already been made, and the meeting had dispersed. The men, however, declared that the strike was not unofficial, pointing out that they had already served the requisite fortnight's notice three weeks ago, when they decided to keep-up the gas services in the public interest pending further negotiations. The Mayor, on behalf of the Corporation, promised that the Wigan Gas Committee should exercise whatever influence they could to satisfy their claim for the full 10s. increase. As their expectations had not materialized in the three weeks' interval, they claimed that they had the right to determine what they regarded as a day-to-day contract at any time they thought fit, notwithstanding the attitude taken-up by their Union.

At a meeting on Friday night, Mr. Williams explained the policy of the Union, and urged that no effective settlement would be possible until the workers returned to duty. The men, however, then decided to continue on strike; their view being that this was the best way of getting their grievances remedied. The Wigan Infirmary authorities gave notice that until the gas supply was again normal, none but the most urgent cases could be received.

On Saturday afternoon, the men were addressed by Mr. J. Allen Parkinson, the Labour Member for the borough, who urged them to reconsider their decision of the previous evening to remain out until the extra 4s. per week was granted. The strikers held a mass meeting, and 36 voted for returning to work under protest, and 16 for remaining out—a number taking no part in the voting. After the meeting, a deputation waited on Mr. Fred Betley (the Gas Engineer), and—as mentioned above—it was arranged that the strikers should resume work on Monday. Mr. Betley, in an interview, stated that householders would be required not to utilize the supplies in the mains until yesterday (Wednesday).

A Strike at Sandown.

All the employees at the gas-works at Sandown, Isle of Wight, came out on strike on Saturday. The town is full of visitors; and the hotels and boarding-houses largely rely upon gas cookers. Voluntary workers promptly assisted to maintain a limited supply for cooking; but the supply for lighting was temporarily suspended. The dispute arose from the refusal of the Gas Company to advance the wages to the full extent of the settlement by the Employers' Federation, with which the Company are not associated.

Nottingham Gas-Workers and Holidays.

Considerable dissatisfaction has been manifested by many of the Corporation gas-workers at Nottingham regarding the terms of the recent award. The decision has been accepted; but agitation has already begun as to the duration of holidays. A deputation representing the local branch of the National Union of General Workers waited upon the Gas Committee recently, asking for an additional seven days' holiday to the seven-day workers, and an extra six days for those engaged upon six days of the week only. It was urged, in support of the request, that gas-workers had fewer holidays than other employees of the Council; but the Committee declined to grant the addition to the national scale.

Fires Follow Strike at Neath.

Several small fires have been reported at Neath in consequence of the gas-workers' strike. The industries which closed-down include all the laundries; and hundreds of men and women were thrown out of work. Business people promptly took to installing electricity on their premises.

An unsuccessful effort to stop the strike was made at the end of last week, when workers' representatives met the Mayor, who earnestly appealed to them to resume work pending the reopening of negotiations, stating that the gas and electricity departments were on the verge of bankruptcy. The men, however, unanimously declined to resume. A special meeting of the Council is to be held to consider the situation.

Gas Manager's Salary at Perth.—The Perth Gas Committee have delayed consideration of a letter which has been received from the National Association of Technical Gas Officials with reference to the salaries of gas managers, which showed that a minimum of £847 per annum should be paid, whereas the present salary in Perth is £475 per year.

Fault Finding at Lewes.—When the Lewes Town Council had before them a notification by the Gas Company of their intention to apply to the Board of Trade for an Order allowing them to increase the maximum charge for gas from 6s. 6d. to 8s. 6d. per 1000 c.ft., Alderman Every said he thought every effort should be made to assist the Gas Company, whose position was very difficult; but the Council had also a duty to protect the consumers. It was common knowledge that the quality of the gas was very deficient; and he moved that the Council call attention to the great deficiency in the supply of gas (many householders in the borough with gas appliances being unable to utilize them, owing to the low pressure), and declare that unless the deficiency was made good they would oppose any increase in the price. The motion was carried.

Public Lighting Control Systems.—Mr. J. H. Davies (the Manager of the Oswaldtwistle Gas-Works) has submitted a report dealing with the relative merits and costs of different methods of public lighting. Three systems were in operation locally—lighting by hand, Alder and Mackay pressure wave system, and the clockwork type for outlying districts. With the pressure wave system, the percentages of lamp night failures was 7·4 p.ct. To obtain satisfactory results under this system, the mains and services must be adequate. Regarding the clockwork system, the percentage of failures was 2·67 p.ct. Many failures were due to bye-pass troubles; and Mr. Davies adds: The weakness of clock controllers is the variation in the times of lighting up. I am firmly convinced the pressure wave type of controller is better, and will prove less expensive and more satisfactory. The wages cost per lamp by hand averaged £1 10s. 5d., compared with 15s. 1d. per lamp under the three combined systems at present in operation.

GAS-WORKS AS BENZOL PRODUCERS.

A campaign to stimulate the home production of motor fuel has been inaugurated in Scotland. Following upon a meeting in Edinburgh, a meeting of motorists was held in the club-house of the Royal Scottish Automobile Club, Glasgow.

Mr. HENRY E. GORDON, of Aikenhead (Vice-Chairman of the club), who presided, said that the purpose of the meeting was to tell the people of Great Britain the importance of the home production of motor fuel. The abnormally high price of motor spirit would continue so long as the supply was short of the demand. An important direction in which relief could be found was in the production of benzol; and one of the aims of the present agitation was to induce corporations and other gas-producing concerns to increase the present production of benzol, which the existing plant was able to do.

Captain R. H. MONTGOMERY (Secretary of the Joint Fuels Committee of various motoring organizations) said the oil position was one of the greatest problems that faced the country. The main sources of home produced fuel were benzol, from the distillation of coal, and alcohol, either from coal gas in the same way as benzol was obtained, or from vegetable sources. We must not continue to burn our coal in its raw state. By treating coal scientifically, we could get 70 p.ct. of efficiency, instead of only 12 p.ct. as at present. Under the stress of war, the gas undertakings of the country produced from 10 million to 12 million gallons of benzol; and there was no reason why they should not be able to turn out from 70 to 80 million gallons. There was no reason why Scotland, from the coal at present being carbonized, should not produce in the gas-works very nearly the whole fuel that was required. It was to secure this end that the campaign had been inaugurated.

Dr. ARCHIBALD BARR said that, in addition to the gas-works, there were the iron-works, which might be large sources of supply. He hoped that, either through legislation or by influence of public opinion, the use of domestic coal in a raw state would be greatly reduced. If all our coal were semi-coked, we should have better fuel for ordinary fires, and have not only benzol but a larger supply of ammonia.

Sir ROBERT GRAHAM said that as much, if not more, benzol could be produced by the gas-works as was done during the war; and he thought pressure in this direction could be brought to bear on the undertakings. He moved a resolution calling upon the Government to require gas-producing concerns to strip completely the benzol from their gases, and to remove restrictions at present hampering the manufacture of commercial alcohol for motor fuel. The resolution also proposed the appointment of a committee to carry out these objects, and to confer with, and exercise pressure upon, corporations and gas companies to further develop benzol extraction, and to take steps to encourage the production of motor fuel of any nature.

The motion was unanimously adopted.

NEWPORT (MON.) GAS COMPANY.

In opening the proceedings at the half-yearly meeting of the Company, Mr. George Geen, J.P. (the Deputy-Chairman), who presided, referred to the loss they had sustained by the death of the Chairman, Dr. M. Brewer. He remarked that Dr. Brewer had been a Director of the Company for the long period of 34 years, and for over ten years had been Chairman. He always took a keen interest in the success of the undertaking and its efficient working. The meeting expressed sympathy with Dr. Brewer's family.

Proceeding to move the adoption of the report and accounts, Mr. Geen said the Directors had continued the extensions at the Crindau works, which had necessitated an outlay during the half year of £5667, bringing the debit balance up to £49,501. To meet this, in ordinary circumstances, there would be an issue of stock; but the present time was not opportune for this, and arrangements had been made with the bankers to extend their accommodation. In regard to the revenue account, while the output of gas for the June half year corresponded very closely with that of last year, the amount received was increased by £3043. The receipts from residuals had been remarkably good, yielding in all an increase of £13,755. On the other hand, the manufacturing costs were more by £8320, and distribution by £6878. Local rates had also seriously increased by something like 72 p.ct. The balance of profit for the half year fell considerably short of what it should be. One serious loss was due to the inferior quality of the coal, which contained a large percentage of dirt and ash. This meant that they were robbed of at least 12½ p.ct. of the proper deliveries of coal, representing for the past half year over 2600 tons, the money value of which at present prices would be approximately some £5000, to which must be added the extra cost of handling useless material, and a reduced make of gas of at least 5 p.ct. per ton of coal carbonized, with a lessened production of tar and ammonia. Repeated appeals had been made to have this evil redressed, but without avail. The question of wages had been a most anxious one, as very heavy increases in working costs, due to advances in wages made by the Industrial Council, and considerable concessions in holidays, overtime rates, and other conditions of working, had come into effect during the half year. It might be interesting to state briefly the additional cost per 1000 c.ft. which had been imposed upon the gas consumers since 1914 by wages increases in the gas industry and the coal trade. Reference to the official records of the Board of Trade showed that in 1914 the wages cost per ton of coal raised was 6s. 3d.; while at the present time this figure had advanced to no less than 22s. 8d. Working out the latter figure upon the tonnage of coal carbonized during the half year, and adding the direct wages paid by the Company to the workmen, it was found that the present wages cost—direct and indirect—amounted to as nearly as possible 4s. 6½d. per 1000 c.ft. of gas sold. In 1914 the total wages cost—direct and indirect—amounted to less than 1s. 4d. per 1000 c.ft.; so that the wages cost alone of gas in Newport had increased in the interim by 3s. 2½d. per 1000 c.ft., which was

3½d. more than the whole pre-war price of gas. The sum of the various increases of wages paid by the Company since 1914, showed that every £1 paid prior to the war would be represented to-day by £2 14s. 1d. The effect of the two items on the revenue account was as follows: Coal and oil represented 2s. 8·2d. per 1000 c.ft., and wages represented 2s. 1·05d., making 4s. 9¼d., as against the price of 5s. per 1000 c.ft. which had prevailed during the half year. Residuals had literally saved the position to some extent. Turning to the profit and loss account, the balance from revenue (£5588) was not sufficient of itself to pay the interest on the debenture stock and the modified dividend of 3¾ p.ct. per annum. It had, therefore, been found necessary, for the fifth half year in succession, to resort to the reserve fund, from which a transfer of £1800 would enable the authorized dividend of 3¾ p.ct. to be paid. The reserve fund had been further depleted by a sum of £1035, by which the investments of the Company had been written-down to present market values.

Replying on behalf of the staff to a vote of thanks, Mr. J. H. Canning (the Engineer) referred to the wages question, and pointed out that during the half year increases had been made at the rate of £14,000 per annum. It might be well to consider what this meant. It meant a tax imposed on every gas consumer in Newport of, roughly, £1 per annum. This was imposed by the agreement dated as late as June 30 last; but already a new application had been made for 6s. per week, which would impose upon the gas consumers of Newport an additional tax of roughly from 5s. to 6s. per head—making a total of at least 25s. He mentioned this to show the very great interest the public must necessarily have in this matter, and he mentioned it also in order that organized labour might see exactly the result of the demands which were being now so lightly made. It was very difficult indeed to tell where the trade union movement was tending, because in face of this they had the Trade Unions Congress the other day, waking up, rubbing its eyes, and looking round, and saying, "Dear me, the cost of living is going up! We must appoint a committee to look into this." It was hard to think that human beings could be so unsophisticated as this. He would like to remind the labour movement that moderation in the hour of success was the surest way to enduring success. Force, uncontrolled by reason and discretion, inevitably brought total ruin. It was perfectly certain that labour, if it pursued these indiscriminate demands indefinitely, would bring total ruin to itself as well as to the country.

INCREASED DEMAND FOR GAS AT CAMBRIDGE.

Gas Company's Meeting.

At the half-yearly meeting last week of the Cambridge University and Town Gas Light Company, the Directors reported a considerable increase in the wages bill—£4427. It was further estimated that, owing to the recent advance, the wages would be increased by another £4000 per annum. The profits on the half year of over £7320 showed an increase of £82 compared with the corresponding period of last year. The yearly production of gas was stated to be 540,000,000 c.ft.; and as this is approaching the limit of the capacity of the carbonizing plant, an increase in this department is urgent, and a large sum of money will have to be spent on extensions.

The chair was taken (in the absence of Mr. E. H. Parker) by Mr. W. B. Redfern, who said that wages for the six months had cost £19,662, as against £15,235, and, as another increase of 6s. per week, *plus* 12½ p.ct., was given on May 1, they might expect the wages bill to be increased by another £4000 per annum. Other items on the expenditure side of the accounts also showed large increases. He was, however, glad to say that the income had kept pace with the expenditure. There had been a very satisfactory increase in the output of gas; and coke, the price of which had been governed by the price of coal, showed an increased return of some £3000. The profit for the half year was £7320, as compared with £7238. He thought they would agree that this was a satisfactory result of their trading in very difficult times. The Directors anticipated that in the near future it would be necessary to expend a large sum of money on extensions of the works, if the great increase in the demand for gas was to be dealt with satisfactorily. The gas consumed during the past half year amounted to 267,000,000 c.ft.; and this, added to the large increase for the December half year, brought the total production of gas to 540,000,000 c.ft. per annum, which approached the limit of their carbonizing plant. Owing to the present-day cost of materials and construction, the outlay required would be necessarily heavy; and the Directors were faced with the position that the capital at present authorized was not nearly sufficient to carry out any large extensions It would be seen from the balance-sheet that they had £17,920 to raise by the issue of shares and £10,050 by loans, a total of £27,970—an amount totally inadequate at the present time for carrying out the necessary enlargements. The recent auction held for the purpose of selling £12,000 of stock was disappointing, as only £2745 was disposed of, and that at a discount of 30 p.ct., or on a basis which gave the investor a return of 7 p.ct. He did not venture to offer any reason for this poor result; but he might point out that the position of shareholders in the Company, compared with those of many other gas undertakings, had been a fortunate one, as they had been able to pay the maximum dividend. Of course it was very necessary, in asking the public to purchase the Company's shares, to be able to give some assurance that so far as one could see they would have a reasonable security for an adequate return upon their investment. He thought such security would be afforded by the Government Bill, which would enable the Board of Trade to authorize a gas company to increase their maximum price to meet the unavoidable increase since 1914 in the cost of producing and distributing of gas. The Directors would take an early opportunity of applying to the Board for power to increase the capital, and to make such an increase in the price of gas as would enable the Company to pay a reasonable dividend on both the old capital and such new capital as it might be found necessary to issue. Investments from the reserve fund to the extent of £5000 had been sold and re-invested in Cambridge Corporation Housing Bonds. The Company employed a large number of work men; and the Directors considered it their duty to subscribe all that they possibly could to support the Corporation in their housing scheme. He alluded to the loyalty of the whole of the staff, particularly the Engineer and Manager (Mr. J. W. Auchterlonie), the Accountant (Mr A. D. Rayner), and the Secretary (Mr. A. E. King).

The report was adopted, and the usual dividend declared.

CHEAP GAS AT SUNDERLAND.

The Sunderland Gas Company have decided to reduce the price of gas by 9d. per 1000 c.ft. for lighting, cooking, and heating; the new price being 1s. 6d. per 1000 c.ft., less the usual discounts. The reduction, which will date from the last readings of the meters, has been made possible owing to the enhanced value of residuals—more particularly coke for shipment.

The nominal price has been 2s. 3d. per 1000 c.ft., but from last December until June, under the Coal (Pit's Mouth) Prices Order and Direction, 1919, a rebate of 10d. per 1000 c.ft. has been allowed; so that actually the new price is 1d. more than has been paid by consumers during the last seven months. At 1s. 6d. per 1000 c.ft., the price is regarded as the lowest in the country—and even in Europe. The charge to power users will be 1s. 4d. per 1000 c.ft.; and in the case of slot-meter consumers, the reduction is equal to the full 10d. per 1000 c.ft.

In the added limits of supply—Whitburn and Hylton—where the present price is 5s. 6d. and 4s. 6d. respectively, the charge will be reduced to 2s. 6d. per 1000 c.ft.

CARBONIZING PLANT AT STOCKTON.

Horizontal or Vertical Retorts.

An interesting report was presented to the Stockton-on-Tees Corporation on Tuesday of last week by the new Gas Manager (Mr. W. W. Atley). Some few months prior to his appointment, he said, it was decided to instal a system of vertical retorts. He had endeavoured to approach the subject without any predisposition whatever, either in favour of vertical or horizontal retorts, and simply viewed it as to what was the best to advise.

He was of opinion that the horizontals could be provided, and the whole of the work carried out, at less than two-thirds of the cost of installing verticals. It was difficult in these days to form estimates, owing to the movements in regard to material and wages; but he was of opinion that horizontals could be installed at a cost not exceeding £45,000, as against, in his judgment, a cost for verticals of £69,000 or £70,000.

Mr. Atley had recommended to the Gas Committee the installation of eight beds of large horizontal retorts, each bed containing ten retorts, at an estimated cost not exceeding £50,000. It was with a full sense of responsibility, he said, that he made his recommendations; but he firmly believed that, if adopted, the expenditure would be justified, and would be in the interests of the undertaking and consumers as a whole. A diagram of the scheme suggested was submitted. This made provision for future extensions, and would enable the works to cope with any further development in consumption during the next ten or fifteen years.

Mr. Atley's recommendations were adopted.

ROTHERHAM CORPORATION GAS ACCOUNTS.

Dealing with the operations of the Rotherham Corporation Gas-Works during the financial year to March 31, Mr. J. S. Naylor (the Engineer and General Manager) reports to the Gas Committee that the quantity of coal carbonized was 23,113 tons, at a cost of £30,641, or 26s. 6·16d. per ton, as against 24 680 tons in the previous year, costing £28,870, or 23s. 4·75d. per ton—a decrease of 1567 tons, and an increase of £1771 respectively.

The gas made was 301,004,000 c.ft., as against 324,659,000 c.ft., a decrease of 23,655,000 c.ft. This decrease is accounted for by the closing-down of national shell factories, and an increased supply of coke-oven gas from Messrs. John Brown & Co., Ltd., of Canklow. The gas made per ton of coal carbonized was 13,023 c.ft., as against 13,154 c.ft. The quantity of gas sold was 288,841,000 c.ft., against 306,703,000 c.ft., a decrease of 17,862,000 c.ft. The unaccounted-for gas was 11·25 p.ct. of the make.

The amount of gross profit made was £10,485, which compares with £10,809 a year ago, being a decrease of £324. The net profit, after allowing for interest, redemption instalments, and contributions to sinking funds, is £401, as against £871.

Maximum Price of Gas at Doncaster.—The Doncaster Town Council have agreed to an application being made by the Gas Committee to the Ministry of Health for permission to increase the maximum price of gas from 4s. 6d. to 5s. 6d. per 1000 c.ft. Mr. Morris (the Chairman of the Gas Committee) said they proposed to increase the price to 5s. The Committee had been reluctantly compelled to take this step because in May there was an increase in the price of coal of 4s. 2d. a ton, which meant an additional expenditure of £3500; and on the top of this they had the recent award, which meant another increase in wages of £3700, involving an outlay of £7200. This was equivalent to 6d. per 1000 c.ft. of gas. The Committee were losing about £500 a month at present; and they could not recoup themselves until they increased the price of gas.

HOW PRICES HAVE GONE UP.

The Croydon Gas Company's Example.

During the last six years, says the "Croydon Co-Partner," the expenses of gas undertakings have of necessity gone up to an enormous extent from causes wholly unconnected with, and beyond the control of, the management. The following instances are quoted to illustrate the bearing of this fact upon the Croydon Gas Company.

Coal has advanced from 20s. 4d. to 51s. 1d. per ton, an increase of 30s. 9d., or 151 p.ct.

Gas tubing has advanced (to take the net price of one typical size) from 2·93d. to 9·34d. per foot, an increase of 6·51d., or 219 p.ct.

In meters, a typical kind has advanced from £1 16s. 3d. to £4 8s. 9d., an increase of £2 12s. 6d., or 144 p.ct.

In gas-fires, a typical pattern has advanced from £1 to £2 15s., an increase of £1 15s., or 175 p.ct.

A weekly pre-war wage of £1 10s. has now become £3 11s. 5d., an increase of £2 1s. 5d., or 136 p.ct.; while recently a further increase has been made of 6s. 9d. per week.

The utmost endeavour has at all times been made by the Company to keep the price of gas to the consumer as low as possible; and the advance on the average net price realized per 1000 c.ft. has been from 2s. 5·763d. to 4s. 2·682d., an increase of 1s. 8·919d., or 70 p.ct. only. On the other hand, owing to the operation of the sliding-scale under these unforeseen, but unfortunately now normal, conditions, the dividends which the Company have been allowed to distribute to their shareholders have (expressed in terms of per 1000 c.ft. of gas sold) been reduced from 6·954d. to 4·652d., a decrease of 2·302d., or 33 p.ct. The effect of this may be seen by the fact that in 1914 23·5 p.ct. of the price of gas sold was divided among the shareholders, while now the amount which may be so divided is 9·2 p.ct. only. The disastrous effect of this upon the holders of capital governed by the sliding-scale clauses (whereby the dividend payable fluctuates inversely to the price charged for gas) will be obvious.

In 1914 the rates of dividend which could have been earned and paid on the Company's ordinary (sliding-scale) capital were 16½ and 13½ p.ct. The Company for many years pursued the policy of paying lower rates of dividend than they were entitled to; and the rates actually declared were 15 and 12 p.ct. The rates which may now be paid are reduced to 10 and 7 p.ct. on stocks much of which were acquired by the present holders at prices yielding (at the 1914 rates of dividends) well under 5 p.ct.

At the annual meeting of the Crowle Gas Light and Coke Company it was decided that no dividend should be paid, owing to the continued increase in the cost of materials and labour.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Aug.* 9.

Pitch continues an active market; there being plenty of inquiry for next season's delivery. Makers' price is not below 195s. per ton f.o.b. works. Creosote is in demand; the price being steady at about 1s. 3½d. per gallon net and naked. Pure benzol and pure toluol are about 3s. 9d. to 4s. per gallon. Solvent naphtha is about 3s. 6d. per gallon. Pyridine bases are quoted from 17s. 6d. to 20s. per gallon. In sulphate of ammonia, there is nothing new to report.

Tar Products in the Provinces.

August 9.

The average values for gas-works' products during the week were: Gas-works coal tar, 110s. to 115s. Pitch, East Coast, 180s. to 185s. per ton f.a.s.; West Coast—Manchester, 180s. to 185s.; Liverpool, 180s. to 185s.; Clyde, 180s. to 185s. nominal. Benzol 90 p.ct. North, 2s. 6d. to 2s. 7d.; crude 65 p.ct. at 120° C., 1s. 8d. to 1s. 9d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 4d. to 2s. 6d. Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 3s. 1d. to 3s. 3d. Heavy naphtha, North, 3s. 4d. to 3s. 6d. Creosote, in bulk, North, liquid, 1s. to 1s. 0½d.; salty, 11½d. to 1s. Heavy oils, in bulk, North, 1s. to 1s. 0½d. Carbolic acid, 60 p.ct., 4s. to 4s. 1d. Naphthalene, £40; salts, £9 to £9 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little change in conditions; the market generally remaining quiet and somewhat irregular. The negotiation of export business is often extremely difficult, especially to Continental destinations, owing to the great fluctuations in exchange that take place. Pitch remains very firm. London prices have passed £10 10s.; while East Coast has nearly reached the round £10. Buyers are still anxious to book for the coming season's deliveries at about current rates; but sellers are not particularly anxious to do business. Naphthalenes are also a strong spot. There is a heavy demand for crude on account of the firelighter industry; while refined is scarce as ever, and makes £55 per ton. Solvent naphtha is about steady, despite a decreasing demand due to poor trade in the rubber manufacturing industries; but heavy naphtha presents a firm front at prices about unchanged, though more readily quoted. Cresylic acid is rather slow in demand; but carbolics are wanted, although crystals are quoted

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lower at 1s. 2d. Creosote is unaltered. Pure benzol is dearer at 3s. 6d. per gallon, and is distinctly scarce; but other benzols show little alteration. Intermediate products have been quiet, with business moving along steadily. There is no improvement in supplies available, and prices are well maintained. Aniline oil and salt are unaltered; but technical salicylic acid is again lower at 2s. 8d. per lb.

The range of quotations is as follows:

Benzol: 90% London 2s. 5d. to 2s. 7d., North 2s. 4d. to 2s. 6d.; 50-90% 2s. 3d. to 2s. 4d. London, 2s. 2d. to 2s. 3d. North; crude 60-65%, 1s. 6d. to 1s. 8d.; pure, 4s. per gallon naked.

Crude Tar: London, 87s. 6d. to 90s.; Midlands, 85s. to 87s. 6d.; North, 85s. to 90s. per ton *ex* works. Refined tar, 65s. per barrel (free) on rail.

Pitch: London, 210s. per ton f.o.b.; East Coast, 195s. per ton; West Coast, 195s., with Manchester 190s. per ton, and Glasgow 195s. per ton; South Wales, 205s. per ton.

Solvent Naphtha: London, 3s. 4d. Provinces average 3s. 3d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 6d. per gallon.

Naphthalene: Refined, £50 per ton nominal; inferior, £35; crude, £14 to £22, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 4s.

Creosote: London, 1s. 1½d. to 1s. 2½d.; North, 1s. 1½d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Pyridine: 20s. to 25s. per gallon.

Aniline Oil: 1s. 9d. to 1s. 10d. per lb., drums extra.

Aniline Salts: 2s. to 2s. 2d. per lb.

Cresylic Acid: 95%, 4s. 9d. to 5s. 3d.; 97-99%, 5s. 6d. to 5s. 9d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 4s. 6d. per gallon; crystals 40%, 1s. 2d. per lb.

Salicylic Acid: Technical, 2s. 9d. to 3s.; B.P., 3s. 6d. per lb.

Xylol: Pure, 6s.; commercial, 4s. 9d. per gallon.

Sulphate of Ammonia.

The demand for sulphate for home consumption remains good, and orders are being accepted for August delivery at fixed rate of £24 per ton, and for October at £25. Export business is limited, as the quantity available has fallen away. Prices also are rather lower at about £48 per ton.

Wages and Gas Profits at Wallasey.—When interviewed as to the likely effect of the recent wages increase upon the price of gas at Wallasey, Mr. A. H. Evans (the Chairman of the Gas and Water Committee) said that there would be so much less than the £15,000 estimated for the relief of the rates; but he did not think it likely that for the present the price of gas would be altered.

Portsea Island Gas Light Company.

At the meeting to-morrow [Thursday], the Directors will present the accounts for the half year ended June 30. The profit and loss account shows an available balance of £21,801; and it is recommended that, subject to the acceptance of the accounts by the Board of Trade, a dividend be declared for the six months at the rates per annum of 7½ p.ct. on the "A" and "B" shares, 6¾ p.ct. on the "C" shares, 5¾ p.ct. on the "D" and "E" shares, and 5 p.ct. on the 5 p.ct. maximum stock (less income-tax), leaving £11,351 to be carried forward. There was again a substantial increase in the quantity of gas sold, compared with the corresponding period of the previous year, and also an increase in the number of consumers. The further rise of 4s. 2d. per ton in the price of coal from May 21, another advance of 1s. per man per day in wages, and the higher cost of commodities generally, have compelled the Directors to apply to the Board of Trade for authority to make a corresponding increase in the charge for gas; and the price for the respective districts sanctioned by this authority will take effect from the beginning of the current quarter. An issue of £98,000 of loan capital in the form of 7 p.ct. debenture stock subject to income-tax, or, at the purchaser's option, 5 p.ct. debenture stock clear of income-tax, both redeemable on July 1, 1930, has been made. This additional capital is required for the payment for the new manufacturing plant at the Hillsea works, in the erection of which good progress is being made. The Directors recommend donations of £100 and £10 10s. to the Portsmouth, Portsea, and Gosport Hospital, and the Portsmouth and Southern Counties Eye and Ear Hospital respectively; and also the distribution during the ensuing winter of 100 tons of coke among the poor residents within the limits of the Company's supply.

Bo'ness Gas Light Company, Limited.—At the annual meeting of the Company, it was reported that the income from gas was £7588, and from residuals, &c., £3279. The expenditure, including allowance for depreciation and other charges, amounted to £9659, leaving a balance of £1208. A dividend of 7 p.ct. free of tax, was declared. Coal cost £971 more than last year, and the wages bill showed an increase of about £340.

Coatbridge Gas Company.—In their report for the year ended June 30, the Directors stated that the total consumption of gas for the twelve months amounted to 268,785,200 c.ft.—being an increase of 2,729,933 c.ft. over the corresponding period. The gas unaccounted for was 7·68 p.ct. The gross revenue from gas, residual products, &c., came to £65,906, and the capital expenditure on plant, &c., to £19,379. Fair progress had been made with the erection of the new vertical retorts, in view of the state of the labour market and the difficulty in procuring material. Dividends were recommended, in accordance with the sliding-scale, at the rates of 9 p.ct. per annum on the original stock, and £6 6s. p.ct. per annum on the four issues of £10 shares, less income-tax.

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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Dunfermline Gas Department Report.

Reporting to the Gas Committee upon the operations of the Dunfermline Corporation Gas Department for the twelve months ended May 15, Mr. James Campbell (the Engineer and Manager) says that the expenditure on revenue account amounted to £55,090, which was £10,193 more than for the previous year; while the income, at £74,004, was £24,298 more. The result is a gross profit of £18,913, and a net profit of £498, which compares with a deficit of £6707 a year ago. The total quantity of gas made during the year was 244,556,000 c.ft., which was an increase of 25,866,000 c.ft., or 11·82 p.ct. The average yield of gas per ton of coal carbonized constituted a record for the department at 10,742 c.ft., as against 9714 c.ft. for the preceding year. The total wages paid on the works came to 14·57d. per 1000 c.ft. of gas made; while for the year ended May, 1914, the figure was 8·04d. The net income from residuals (£22,229) amounted to just over twice as much as in the previous year—viz., 70 p.ct. of the cost of the coals. During the year, Mr. Campbell says, the oldest set of four vertical retorts collapsed; and later another set of four was destroyed by explosion. This was a serious loss of producing plant; and during the winter all the remaining plant was worked to its utmost capacity in meeting the increased demand for gas. The new settings of Woodall-Duckham vertical retorts will provide producing capacity of 50 p.ct. in excess of last winter's requirements. The question of gasholder accommodation will require serious consideration at no distant date. The capacity of the present holders is only 500,000 c.ft., or less than one day's consumption at the period of minimum output (June). The maximum daily output has been 954,000 c.ft., from which it will be seen that the storage is only equal to about twelve hours' demand at maximum output.

Shrewsbury Gas Light Company.—The profit of the Company on the working for the year ended June 30 amounted to £5803; and the Directors recommend the payment of a dividend of 3 p.ct., less tax. There has been an increase of 9¾ million c.ft. in the quantity of gas sold.

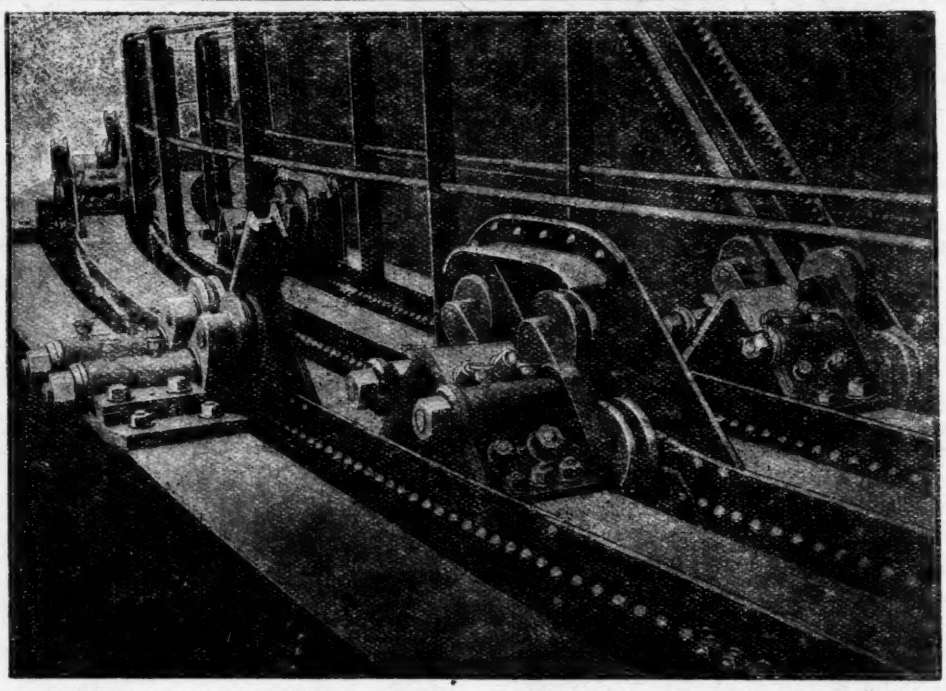
Co-Partnership Fund at Aldershot.—The ninth year's results of the scheme were shown in the co-partnership accounts for the twelve months ended June 30 relating to the Aldershot Gas, Water, and District Lighting Company, which were submitted at the annual meeting of co-partners last Friday. The bonus was at the rate of 1⅛ p.ct. per annum, the same as the dividend on the "B" consolidated stock of the Company, and amounted to £369, which sum has been placed to the credit of the co-partners' "free" and "investment" accounts respectively. The total distributed since the inception of the scheme represents £6293; and the nominal amount of stock transferred now totals £2452. The number of co-partners is 203, as compared with 164 twelve months ago. The savings account this year gives the record figure of £1264; and no less than £5298 has been passed through this account since 1913.

Railway Carriage of Gas Liquor.

At a sitting of the Railway Rates Advisory Committee, held towards the end of last month, evidence was given by Mr. John Lukes (Traffic Manager to Messrs. Brotherton & Co., Ltd., of Leeds) with regard to the conditions governing the transport of gas liquor, and the proposed increase in Class A traffic charges. This increase, he said, if carried into effect, would stop the conveyance by rail of such traffic as gas liquor in owners' tank-wagons. The value of the liquor was only (say) from 12s. 6d. to 18s. per ton. His firm removed from gas-works some 30,000 to 40,000 tons per annum in their own tank-wagons; and the average rate prior to Jan. 15 was about 3s. 6d. per ton. This meant, under the railway companies' proposals, an addition of 4s. per ton. Then there was the additional cost in connection with the tank-wagons, the outlay on the provision and repair of which had been very largely increased. The effect of all this would be an increase of from 12½ to 15 p.ct. on the present price of ammonia. The suggested rise in the cost of carriage was a great deal too much for this class of traffic, and if persisted in the firm would likely be unable to continue collecting the ammoniacal liquor from gas-works, which would cause considerable inconvenience—to say nothing of the loss of revenue to the railway companies. He did not know of any gas-works which did not to-day utilize in some way their gas liquor; but in many cases his firm had to send very long distances to get it, and when they did so they could not, of course, pay much for it. Many bye-products which were formerly sent by rail were now worked-up by the undertakings themselves.

Strange Accident to a Gas-Main.—A gas-main was fractured a Littlehampton last Wednesday in a very unusual manner. In consequence of the brakes refusing to act, a passenger train failed to pull-up at the platform, and after crashing through a brick wall separating the station from Albert Road, the engine came to a standstill within a couple of feet of the houses on the further side of the roadway. The gas-main under Albert Road was broken by the engine passing over it; and the gas became ignited by some sparks from the engine. The supply of gas was cut-off at the works.

Lighting of Thurstonland.—The District Council of Thurstonland, a township high on the hills above the Holme Valley, Yorkshire, have been seeking authority for a gas supply scheme for local lighting. Owing to its position on the rough moorland country, the place still depends on oil lighting, though in a part of the West Riding which is crowded with industrial towns of all sizes. The Council have just received a disappointing reply from the Board of Trade, stating that the Board have no power to grant a Provisional Order authorizing an undertaking to supply gas in an area which is within the authorized limits of supply of any other gas undertaking, as is the position of Thurstonland. Some hope is held out in the added statement that when the Gas Regulation Bill becomes law the Board may be empowered to make a Special Order.



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MANCHESTER.

Main Extensions at Biddulph.—At a meeting of the Gas Committee of the Urban District Council of Biddulph, estimates were submitted in connection with the extension of the gas-mains to Brown Lees, Gillow Heath, and Pool Fold. It was stated that the cost of laying cast-iron pipes would be £4768, and steel pipes £4510. The Council decided to adopt the latter, and to apply to the Minister of Health for powers to borrow £5000, which would include £490 for future expenditure.

Silsden Gas-Works Extensions.—The Silsden Urban District Council have learned that the Ministry of Health have sanctioned the borrowing of £6520 for gas-works extensions, including a carburetted water-gas plant and a dehydrated tar tank and boiler, the erection of a station governor, and main-laying work. With regard to a proposed enlargement of the tar and liquor tanks, the Ministry require the opinion of a competent engineer as to what existing materials could be utilized and what structural alterations would be necessary. The Gas Committee have decided to secure the services of an engineer to provide the information requested.

The gas-stove department of the Planet Foundry Company, Ltd., has been sold to General Appliances, Ltd., of Guide Bridge.

The Selkirk Town Council have decided to have a complete installation of automatic lighting, which will necessitate the fitting-up of a further 100 "A. & M." [Alder & Mackay] patent pressure-wave automatic controllers. Last winter half of the town was fitted with the "A. & M." controllers; and, due to the satisfactory working of the system, the Council have decided to have the whole town fitted.

Mr. Chadwick, as Chairman of the Lytham Gas Committee, stated last week that the department was faced with a great problem; and he believed it would be necessary to raise the price of gas by 1s. per 1000 c.ft. They had a heavy expenditure before them in connection with repairs and extensions; and wages, &c., had increased the yearly cost by £2000. Last year the expenditure was £1421 more than the receipts.

The August number of "Unity" made its appearance in a considerably altered form. Essentially the organ of the National Alliance of Employers and Employed, its policy is to advocate peace in industry. The desire is to make an appeal to the widest possible class of readers, so as to put before the general public the true value of the National Alliance. The price of the paper is twopence; and it is published monthly at No. 64, Victoria Street, S.W.

Following the recent acquisition of the Old Silkstone Collieries, Ltd., by Sir Archibald Mitchelson, Bart., of Pinners Hall, E.C., Major F. Middleton, who has held the position of Secretary and Commercial Manager since the inception of the Company in 1900, and Mr. L. C. Parkin, who has held the position of Agent to the Company since 1907, have been appointed Directors of the Company. Mr. S. P. Harrison, who has been Cashier, has been appointed Secretary.

The latest list of new companies registered includes Messrs. E. Hardman, Son & Co., tar distillers, of Hull, with a capital of £20,000 in £1 shares.

The Directors of the Sheffield Gas Company have declared interim dividends for last half year at the rate of 5 p.ct. per annum on the "A" stock, 4 p.ct. per annum on the "B" stock, and 3½ p.ct. per annum on the "C" stock, less tax. Last year 5 p.ct. per annum on the "A" and "B" stocks and 4½ p.ct. on the "C" stock were paid.

At a meeting of the Lurgan Town Council, a report was received from the Gas Committee recommending that the salary of Mr. J. A. Tallentire (the Gas Manager) be increased by £65 to £440 per annum —bonuses hitherto given to be merged. It was agreed, on the motion of Mr. E. Mullen, seconded by Mr. T. Brady, to delete the reference to the merging of the bonuses.

After consultation with the Clerk to the Doncaster Rural District Council, the Parish Council of Bawtry have decided to call a public meeting to seek sanction to spend £108 in lighting the gas-lamps during the coming winter. A public meeting last month refused this sanction. A deputation are to try to obtain from the Bawtry Gas Company a reduction in the charge for lighting.

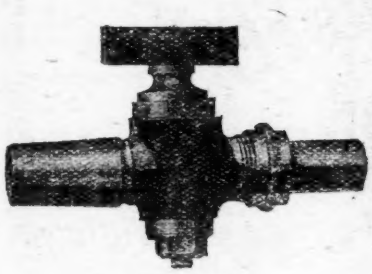
The old-established firm of Messrs. William Coward & Co., Ltd., who have for many years acted in London for Australian and New Zealand corporations and gas companies, are moving on the 16th inst. from their present premises No. 100, Bishopsgate, E.C., to No. 22, Buckingham Gate, Westminster (telephone, Victoria 4292). This move will bring Messrs. Coward into the very heart of the engineering community and facilitate a rapidly developing business in the purchase and shipment of plant to the Dominions.

Mention was made by the Chief Engineer (Mr. G. M. Gill), at a recent meeting of the Co-Partnership Committee of the South Metropolitan Gas Company, of the case of one of the employees who had been ordered by his Trade Union to leave the Company's service, and had refused to do so. A fine was then imposed each week he remained at work, until he was finally expelled from membership. He then took action against his Society for wrongful expulsion, and claimed compensation to the amount of £75—the Union also having to pay him £150 costs.

The athletic sports of the South Suburban Gas Company took place last Saturday at the London County Athletic Ground, Herne Hill. The programme contained many interesting events, which were keenly contested by the representatives from the various works. Sydenham succeeded in carrying off most of the honours, by winning thirteen first, six second, and three third prizes. The Silver Cup presented by Mr. Charles Hunt for the competitor scoring the largest number of points during the sports was tied for by Mr. C. B. Stevens (Sydenham) and Mr. J. Spencer Satch (Sidcup). The prizes were presented by Miss Hunt, the daughter of the Chairman of the Company.

BEST GUN-METAL MAIN TAPS

OBLONG GASWAY. ROUND GASWAY. OBLONG GASWAY.



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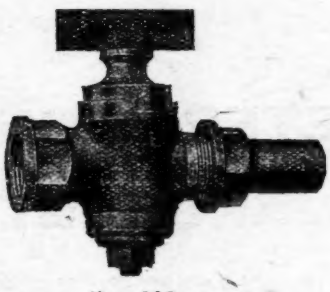

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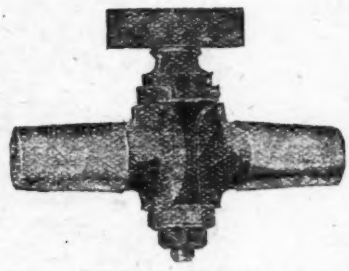

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The rate of 4s. per 1000 c.ft. of gas to householders in Glasgow is to remain unaltered; but considerable concessions to consumers for power and manufacturing purposes are recommended by the Committee.

Several people were overcome by gas in Glasgow one day last week. During the previous night a prepayment meter had been stolen from a house in Savoy Street; and the resultant escape of gas so much affected the inmates that two of them were removed to the infirmary in an unconscious condition.

Among those taking part in a successful bank-holiday carnival in aid of the local hospital were the Worthing Gas Company, who provided an attractively decorated lorry, with a gas cooking exhibit. A supply of gas was carried on the lorry, with the result that cakes and cups of tea were prepared and served hot to the public during the tour; no fewer than 1600 cakes being thus handed out. The arrangements for the carnival were in the hands of a Committee (under the chairmanship of Mr. Sidney O. Stephenson), whose efforts resulted in the collection of nearly £300 for the hospital.

On Saturday, the 31st ult., the head office staff of Messrs. Falk, Stadelmann, & Co., Ltd., had an outing to Rye House, Hertfordshire, where they were entertained by the Directors to dinner and tea. Mr. J. W. Laidler proposed the toast of the firm, which was replied to by Mr. Max Falk (the Chairman), who pointed out that the firm had one of their first outings to Rye House some thirty years ago, when the guests numbered about 50, compared with 680 on the present occasion. During the day there were some impromptu sports; prizes being presented by the Chairman of the Company. Altogether a very enjoyable day was spent. On the previous Saturday, 80 of the male staff of the "Veritas" mantle works, Garrett Lane, Wandsworth, had an outing by motor charabancs to Brighton; and the female staff, numbering some 500, will have a similar outing on the 21st inst.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Aug. 5.]

Nos. 22,169—22,839.

BROWN, W. T.—"Ascension-pipes." No. 22,432.
BURCKHARDT, R. W.—"Device for mixing gaseous strata flowing in flues, &c." No. 22,753.
COLMAR BURNER COMPANY.—"Burner attachments." No. 22,658.
COLMAR BURNER COMPANY.—"Gas-generators." No. 22,659.
CRUSE & Co., DR. H.—"Gaseous or liquid fuel burners." No. 22,424.
DAVIDSON, T. M.—"Destructive distillation of coal, &c." No. 22,487.
DAVIS, R. H.—"Valves for controlling flow of gases." No. 22,688.
DAVIS, R. H.—"Flow-meters for gases." No. 22,689.
DRAYTON, N. D. GRIMKE-.—"Gas-compressing plant." No. 22,619.
EVANS, E. V.—"Process for removing hydrogen sulphide from gases." No. 22,585.
FABRY, R.—"Process for obtaining sulphur from hydrogen sulphide." No. 22,185.
FARBWERKE VORM. MEISTER, LUCIUS, & BRÜNING.—"Process of desulphurizing gases." No. 22,460.
FISHER, S.—"Devices for measuring and indicating flow of liquids." No. 22,834.
FREGONARA, C.—"Safety device for gas welding-plants." No. 22,728.
GOOLD, L. W.—See Colmar Burner Company. Nos. 22,657, 22,658, 22,659.
HODGSON, J. L.—"Gas-meters." No. 22,783.
HURD, M.—"Incandescent gas-mantles." No. 22,405.
JACKSON, J. E. EVANS-.—See Brown. No. 22,432.
JUSTICE, H. H.—"Cooling systems for gas-engines." No. 22,580.
LEWIS, J.—"Incandescent gas-burners." No. 22,505.
MARLOW, J. H.—"Gas-fired ovens or kilns for manufacture of tiles, pottery, &c." No. 22,641.
MATTHEWS, A.—"Gas-stoves." No. 22,634.
O'BRIEN, E. J.—See Justice. No. 22,580.
PEASE, E. L.—"Extraction of ammonia from gases." No. 22,534.
PIETERS, J.—"Retaining device for coke, &c,, resulting from distillation in vertical retorts." No. 22,350.
PIETERS, J.—"Apparatus for discharging material at the base of vertical retorts." No. 22,351.
PIETERS, J.—"Arrangement for evolving distillation gases in vertical retorts." No. 22,352.
PLAISSETTY MANUFACTURING COMPANY.—"Manufacture of incandescent gas-mantles." No. 22,427.
SCHROEDER, R. W.—"Flow-meters." No. 22,206.
SOPER, J. P. H.—See Plaissetty. No. 22,427.
SOUTH METROPOLITAN GAS COMPANY.—See Evans. No. 22,585.
STANIER, H.—See Evans. No. 22,585.
SUTHERLAND, A. G.—"Diaphragms, &c., for gas-meters, &c." No. 22,190.
TERRELL, T.—See Plaissetty. No. 22,427.
THOMPSON, W. P.—See Cruse & Co. No. 22,424.
TOOTH, L. F.—See Drayton. No. 22,619.
TOZER, C. W.—"Low-temperature carbonization and gasification of coal, &c." No. 22,637.
TOZER, C. W.—"Vertical retorts." No. 22,638.
WARD, P. W.—"Gas-mantle." No. 22,514.
WHITE, H. S.—"Compressors." No. 22,428.
WILKINSON, T.—"Pipe-joints." No. 22,277.
WOOD, E. A.—"Automatic controlling devices for gas-burners." No. 22,569.

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STOCK MARKET REPORT.

THE chronicle of business done on the Stock Exchange during August Bank Holiday week is normally a very light one; and this year's record is no exception to the rule, but rather the reverse. For, in addition to the abstention of the many who were seeking pleasure and rest, there was a general disinclination on the part of those present to take much risk of any kind. Every consideration enjoined caution. The Russo-Polish crisis had become actually alarming; the Irish question was almost maddening; and waning trade returns, and portentous threats of labour difficulties on a large scale were sufficient to damp enterprise. Thus every market was a sufferer more or less; and prices weakened pretty well all round.

The gilt-edged department, however, was not hard hit. Home Government issues, after moderate fluctuations of frequent occurrence, closed with a very good recovery. Friday's figures showed hardly any change—viz., Consols 46⅛-46⅜, War Loan 84 13/16-85, Funding 69⅜-69⅞, Victory 77⅜-78⅛. Corporation issues held their own fairly well.

Home Rails showed continued weakness in view of the many anxieties which overshadow them. Canadians were kept down by adverse exchange, and Argentines were quite easy.

The Foreign Market was mostly weaker. French fell to exchange, and Belgian, Russian, Brazilian, Chinese, and Japanese were easy.

The Miscellaneous Market was flat generally—Rubber, Oil, Ships, Nitrates, and Insurance giving way.

Business in the Gas Market was very lacking in animation; and the whole output of the four-day week did not amount to much. The tendency, too, was downward. In Gas Lights, the ordinary touched 51½, with a decline of 4 in the quotation. The other issues were steady. South Metropolitan also was easier; and the quotation fell 2. In Provincials, South Shields was quoted 2 lower, and Newcastle debenture lost 1. In Continentals, European was firm, and seemed to promise a further advance; but Imperial was done at lower figures, and the quotation was lowered 6.

Bargains done for cash during the week were as follows: On Tuesday, European 6⅛, 6 2/16. Gas Light ordinary 56, 56⅜, 56⅛, ditto debenture 47, 47¼. Imperial Continental 122, 124, Primitiva 13s., ditto preference 33s. 9d., River Plate debenture 45, South Metropolitan 58¼. On Wednesday, Gas Light ordinary 55⅞, 56, ditto maximum 39, ditto preference 57⅜, Imperial Continental 122, 123, 123½, Liverpool 59⅜, Monte Video 74, Primitiva preference 33s., South Metropolitan 57¾, 58¼. On Thursday, Brentford "A" 48, 48¼, 49⅜, ditto debenture 60, Gas Light ordinary 53, 53½, 55, ditto debenture 46½, 47, 47½, Imperial Continental 122⅜, Primitiva 12s. 6d., South Metropolitan 55, 56, 57¾, 58. On Friday, Commercial 4 p.ct. 51, ditto 3½ p.ct. 45¾, European 6¼, Gas Light ordinary 51½, 52, 52¼, 53. Primitiva preference 33s. 6d., South Metropolitan 55, 56, 58, Brighton and Hove 4 p.ct. debenture 60, Grays and Tilbury "B" 17.

In the Money Market, the relief to the harder position which marked the week before last until almost the close was maintained throughout the week just concluded. Discount rates kept in step until Friday, when a change took place and rates hardened materially. Silver was in demand, and the price rose to 59⅜d. The Bank rate is 7 p.ct., as fixed on April 17.

At a Housing and Health Exhibition which will open in Glasgow on Sept. 15, the Corporation Gas Department are arranging to make an attractive display.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	58—63	...
1,551,868	,,	Mar. 26	2½	3 1/16%	Alliance & Dublin Ord.	59—64	42—47	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	55—60	...
280,000	5	May 13	7½	8%	Bombay, Ltd.	5½—6½	4½—5½	...
50,000	10	Feb. 26	16	10%	Bournemouth Gas and Water — 10 p.c.	29—30	8½—9	...
383,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	9—10	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	8—9	...
162,065	—	June 25	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	...	62—64	...
992,045	Stk.	July 14	14	30/-	Brentford A Consolid.	261—266	45—50	48—49½
734,920	,,	,,	11	26/3	Do. B New	204—209	43—48	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	June 10	4	4%	Do. 4 p.c. Deb.	91—93	63—65	60
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	121—126	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	80—85	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	April 14	12½	10%	British	44—45	22—24	...
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	45—48	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	,,	—	4½%	Do. 4½ p.c. Pref.	4—6	5½—6½	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Feb. 26	5/9/4	33/4	Commercial 4 p.c. Stk.	106—108	51—56	53
560,000	,,	,,	5½	26/8	Do. 3½ p.c. do.	103—105	44—49	45½
475,000	,,	June 10	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	45—47	..
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	27—32	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—60	...
51,600	,,	Feb. 26	14½	10½%	Croydon A 10 p.c.	...	130—140	...
278,400	—	,,	11½	7½%	Croydon B and C 7 p.c.	..	90—100	...
492,270	Stk.	—	6	5%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	5⅞—6½	6 5/16—6½
16,298,975	Stk.	July 29	4/17/4	30/-	Gas Light and Coke — 4 p.c. Ord.	98—102	50—55*	51½—56½
2,600,000	,,	,,	3½	26/3	Gas Light and Coke — 3½ p.c. max.	76—79	39—44*	39
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	55—58*	57½
4,674,850	,,	June 25	3	3%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	46—49	46½—47½
130,000	,,	Dec. 11	10	10%	Gas Light and Coke — 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	55—60	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	38—43	...
70,000	10	May 13	11	7%	Hongkong & China, Ltd.	16½—16¾	8½—9¾	...
86,600	Stk.	Mar. 11	9	6½%	Hornsey 7 p.c.	...	88—93	...
131,000	,,	,,	7½	5½%	Ilford A and C	151—154	86—91	...
65,780	,,	,,	6½	4½%	Do. B	115—118	65—70	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb.	92—94	55—58	...
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	118—123	122—124
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	80—85	...
235,242	,,	Mar. 26	6½	5½%	Lea Bridge Ord. 5 p.c.	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. — A.	211—213	...	59½
					Liverpool 5 p.c. Ord. — B.	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 26	7/5/6	3½%	Maidstone 5 p.c.	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1½—2½	...
250,000	100	April 1	4½	4½%	Met. of Melbourne — 4½ p.c. Deb.	99—101	89—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	70—75	74
1,875,892	,,	July 29	4½	3½%	Newcastle & Gatsh'd Con.	98½—99½	60—61*	...
529,705	,,	June 25	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	8½%	North Middlesex 10 p.c.	...	13—13½	...
55,940	10	,,	7/14/0	6½%	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	May 13	8	8%	Oriental, Ltd.	117—122	99—102	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
60,000	50	Mar. 11	13	7½%	Portsea Island, B	128—131	66—71	...
100,000	50	,,	12	6½%	Do. C	118—121	53—58	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	⅛—1	12/6—13/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	1¼—2	33/—33/9
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	69—71	...
600,000	Stk.	July 29	4	4%	Do. ,, ,, 1911	...	45—48*	...
346,198	,,	June 25	4	4%	River Plate 4 p.c. Deb.	85—87	45—48	45
150,000	10	Mar. 26	6	6/-	San Paulo — 6 p.c. Pref.	10½—11	6¼—7½	...
125,000	50	July 2	5	5%	San Paulo — 5 p.c. Deb.	47—49	38—40	...
135,000	Stk.	Mar. 11	10	50/-	Sheffield A	223—224	68—73	...
209,984	,,	,,	10	4½%	Do. B	222—224	58—63	...
523,500	,,	,,	10	35/5	Do. C	220—222	54—57	...
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 25	9	9%	South African	10½—11½	11—12	...
6,600,895	Stk.	Feb. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	54—59	55—58½
250,000	,,	July 14	—	5%	Do. Pref.	...	91—93	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	45—47	...
224,820	,,	Feb. 26	8½	5%	South Shields Con. Stk.	157—159	97—99	...
1,087,795	,,	July 29	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	60—65*	...
247,558	,,	June 25	5	5%	Do. 5 p.c. Deb. Stk.	116—118	71—76	...
647,740	,,	May 13	7½	3½%	Southampton Ord.	99—102	57—60	...
121,275	,,	June 25	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 14	—	3½%	Tottenham and District — A 5 p.c.	135—138	60—65	...
732,273	,,	,,	6	2½%	Tottenham and District — B 3½ p.c.	115—117	52—57	...
181,255	,,	June 10	4	4%	Tottenham and District — 4 p.c. Deb.	87—89	60—63	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mar. 11	5	3½%	Tynemouth 5 p.c. max.	108½—109	71—73	...
30,000	,,	Feb. 26	8½	55/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	83—88	...
255,636	,,	,,	6½	40/-	Do. B 3½ p.c.	129—134	61—66	...
108,075	,,	,,	—	38/6	Do. C	...	61—66	...
140,865	,,	,,	—	38/6	New Ordinary	...	61—66	...
352,000	,,	,,	6½	33/9	Wimbledon 5 p.c.	117—122	58—63	...
98,000	,,	,,	6½	40/-	Epsom 5 p.c.	121—126	58—63	...
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk.	66—69	44—47	...

* Ex Div.

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